RAILROAD GAZETTE

SATURDAY, AUGUST 3, 1872.

THE MASTER MECHANICS' ASSOCIATION.

Official Report of the Fifth Annual Convention.

THIRD DAY.

[Continued from page 324.]

On coming to order, a paper was read by Mr. Gordon H. Nott, an associate member, which, on motion of Mr. Hayes, was received and placed on file, and the thanks of the Association returned therefor.

USE OF FUEL FOR GENERATING STEAM.

To the American Railway Master Mechanics' Association:

I trust that all suggestions which may be submitted to the Association will find a kind reception; this reflection, consequently, gives me co rage to submit the following remarks.

For some years I have given practical attention to the study of the economical application and the use of fuel for the generation of steam, and especially as applied to the use of the locomotive in its round of daily service, which I will endeavor to state to you in a concise manner and with the conclusion of the study of this important and interesting subject—endeavoring to gain facts, during the progress of practical trials.

I find that the more the water surfaces and spaces are increased, which come in immediate contact with the burning fuel—certainly when *combustion* is progressing—that the partially consumed fuel will, when in an imperfect state, as it always is after rising from the bed of fuel, invariably become an agent for injury to the iron the moment it reaches the cooling surfaces of water, and the conduction of the heat and the generation of steam will be very much retarded and the efficiency consequently reduced.

The trials which I have made with the locomotive cover a period of more than twenty years, and have been conducted for the purpose of ascertaining the best plan for overcoming the deteriorating effect of the cooling chambers of water around the locomotive fire-box upon the volatile fuel. I have, I trust, ascertained that to reach good combustion and a clean heat for the fuel during the time of its transformation from the raw state, on and above the grate bars, that its after preparation must be between the top of the bed of coal and before reaching the flue entrance. The light, disengaged fuel must find room and time within the fire-box, and in that portion where there is an *intense white heat*, which is only in the central part and away from the water surfaces. The volatile fuel retained in this *hopper* of white heat, for the least appreciable time more than at present, for mixture, will certainly produce a more clean heat.

I find that the direct course of the fuel from the bed of coal to the flue entrance is directly opposed to a good combustion.

The results of numerous investigations relating to the use of fuel in the fire-box of the locomotive prove that the light products of an imperfect combustion coming up from the bed of coal and afterwards coming in contact with the surfaces between the heat and the water, must be checked in the central part of the fire-box, for as soon as they reach iron protected by water, the opportunity for producing a clean heat is over.

A column of light fuel such as bitumen, smoke, etc., passing through the tubes will only act as a self-retaining, movable conductor. This body, in its passage through the boiler masses, collects and retains the heat of an imperfect combustion, and as it moves through the tubes, produces a partial condensation; and the non-conducting qualities of this column retain the heat which cannot pass off to the water however much the draft may cleanse the surfaces; it is nonducting and holds the heat. To overcome this difficulty the fire-box must be used as an arrester.

The raw coal, immediately after it enters the fire-box, at once produces non-conducting material. A plan that will *require* a very thin fire and allow the *air* to *come up* and pass through the intense heat and then be thoroughly mixed will be of immense advantage, as the intensity of the heat, away from the cooling water surfaces, is different from that of other than railway exigencies. An instant gained here is unlike that of any other way of generating steam.

I think that it is acknowledged that there is now scarcely any time for *mixture* free from the contaminating influences of the water surfaces. Time must be gained, but at a light cost or there will be a balance of accounts.

The light fuel and the air must each exhaust the other and produce, as a result, a clean heat; when either is in excess, a poor result will at once be noticed.

It appears to me that the volume of air admitted under the fuel is generally more than is needed for efficient application; as any excess coming from this direction will be of great disadvantage, after reaching the space between the bed of coal and the flue sheet.

Any plan that can be devised for retaining the imperfect combustion will also be a check upon the extravagant use of fuel, as the moment this occurs the air will be more than supplied. One of the causes of the failure of the "combustion chamber" was owing to the contracted room and the close contact of the water spaces with the light fuel coming from the fire-box—the temperature of the water being so much less than that necessary for combustion that the light fuel is rapidly condensed and precipitated. All practical trials prove that the fuel, during its preparation for making steam, must be kept away from all parts of the boiler protected by water surfaces, as for some distance from the actual contact there will be a constant partial condensation of the fuel.

In the plain fire-box the products of an imperfect combustion are thrown against the *center* of the tube-sheet with all its *force* and intensity, which is the very part where there should be uniformity of action. Here we find a weak part of the boiler subject to an immense heat and impure combustion. A remedy that will apply to the mixture and gaining of time in the central part of the fire-box must serve to modify the force of this column against the tube-sheet.

The cumulated experience of the locomotive department of railway engineering is, that time for a thorough mixture must be gained, whatever may be the size of the fire-box—less for a long than a short one. In the use of a *long* fire-box there is a gathering of injurious gases when the tubes are reached; with the small one, this gathering is not so large, but the mass of the products of poor combustion are more.

Truly yours, GORDON H. NOTT.

COMMITTEES ON SUBJECTS FOR NEXT MEETING.

The President announced the following committees on the subjects presented for consideration at the next annual meeting:

1. *Locomotive Boiler Construction*—S. J. Hayes, Illinois Central; J. Losey, Louisville, New Albany & Chicago; J. B. Gregg, Erie Railway, Committee.

2. *The Operation and Management of Locomotive Boilers, including the Purification of Water*—H. A. Towne, Hannibal & St. Joseph; A. H. De Clercq, Toledo, Peoria & Warsaw; Harry Elliott, Ohio & Mississippi, Committee.

3. *The Comparative Value of Anthracite Coal, Bituminous Coal and Wood for Generating Steam in Locomotives*—Charles Graham, Lackawanna & Bloomsburg; L. S. Young, Cleveland, Columbus, Cincinnati & Indianapolis; B. H. Kidder, Lake Shore & Michigan Southern, Committee.

4. *The Construction, Operation and Cost of Maintaining Continuous Train-brakes*—J. M. Boon, Pittsburgh, Fort Wayne & Chicago; J. Johann, late of Missouri Pacific; W. S. Hudson, Rogers Locomotive Works, Committee.

5. *The Relative Cost of Operating Roads of Gauges of 3ft. 6in., or less, and those of the Ordinary 4ft. 8½in. Gauge*—J. T. Robinett, Atlantic, Mississippi & Ohio; J. U. Eastman, Nashville & Chattanooga; W. Bell Smith, South Carolina Railroad, Committee.

6. *The Construction and Operation of Solid-end Connecting Rods for Locomotives*—J. Sedgley, Lake Shore & Michigan Southern; J. W. Nesbitt, Evansville, Terre Haute & Chicago; N. E. Chapman, Cleveland & Pittsburgh, Committee.

7. *Resistance of Trains on Straight and Curved Tracks, and on Wide and Narrow-gauge Roads, and with Four or Six-wheeled Trucks, and with Long and Short Wheel-base*—W. A. Robinson, Great Western of Canada; Wm. Jackson, Rome, Watertown & Ogdensburg; C. T. Ham, late of New York Central & Hudson River, Committee.

8. *The Efficiency of Check or Safety Chains on Engine, Tender and Car Trucks in Lessening the Danger Resulting from Running off the Track*—R. Wells, Jeffersonville, Madison & Indianapolis; C. R. Peddle, St. Louis, Vandalia, Terre Haute & Indianapolis; J. L. White, Evansville & Crawfordsville, Committee.

9. *The Machinery for Removing Snow from the Track*—J. W. Philbrick, Maine Central; J. N. Foss, Vermont Central; E. Studley, Concord Railroad, Committee.

10. *The Machinery and Appliances for Supplying Fuel and Water to Locomotives*—H. L. Leach, Hinkley & Williams Locomotive Works; Wilson Eddy, Boston & Albany; E. Garfield, Hartford, Providence & Fishkill, Committee.

11. *The Machinery and Appliances for Removing Wrecks and Erecting Bridges*—Morris Sellers; D. O. Shaver, Pennsylvania Railroad; S. Moore, Pittsburgh, Fort Wayne & Chicago, Committee.

12. *The Best Form and Proportions of Axles for Cars and Locomotives, also Whether there is Anything to be Gained by the Use of Compound Axles and Loose Wheels*—M. N. Forney, Coleman Sellers, Gordon H. Nott, Committee.

The PRESIDENT—We have several committees that continue over, but I think it will be unnecessary to read the list. We have also a recommendation from the Corresponding Committee that a quantity of correspondence be read. Is it your pleasure to have it read now?

Mr. HAYES, Illinois Central Railroad—I move that those papers be laid aside, and if we have time that they be read, but not at present. Agreed to.

The PRESIDENT—There is no report this year on narrow and broad-gauge roads. The committee consists of Mr. Burke, Memphis & Charleston Railroad; Mr. Waugh, Kansas Pacific Railway; Mr. Philbrick, Maine Central Railroad. I have had a letter from Mr. Waugh, saying it would be impossible to make a report. The next report in order will be on the Comparative Performance and Cost of Operation of Eight and Ten Wheel Engines for Freight Service.

Mr. HAYES, Illinois Central Railroad—I believe the report on incrustation was postponed yesterday until to-day, because there was no time. Is not that the next in order?

The PRESIDENT—The report on incrustation was received yesterday.

The report of the Committee on Boiler Incrustation was read, and, on motion, voted that it be received and placed on file.

The report on Boiler Incrustation was then read, as follows:

REPORT ON BOILER INCRUSTATION.

HANNIBAL, MO., May, 1872.

To the American Railway Master Mechanics' Association:

GENTLEMEN: The Committee to whom it was your pleasure to again refer the subject of Boiler Incrustations, their Causes and Cure, would respectfully report that they have given the matter as serious a consideration as the time and its great difficulties would permit. In accordance with former practice, circulars of inquiry have been addressed for information to various parties, but to such only as might have something to offer from investigations made since our last annual meeting. We regret that no new or important information has been elicited, throwing additional light upon the subject. Your Committee being, therefore, unable to present any new facts, will have to confine itself to an allusion to the experiments which have been going on for the past two years and also to speculation upon the relative cost of purifying water before it is taken into the boiler, if indeed such a thing can be accomplished at all. In justice to Mr. J. H. Setchel, who has written at considerable length on the subject, the Committee would suggest that his communication be read in full.

The use of pure water is universally recommended as being the only effectual remedy. Some, however, are still experimenting with fluids, powders, batteries, etc. It will be remembered that the plan (or a similar one) recommended last year by Mr. S. J. Hayes, of the Illinois Central Railroad, was indorsed by the Committee, and embodied in their report as the fundamental principle through which only this great evil can be effectually overcome. It is the opinion of your Committee that the impurities contained in water will precipitate sufficiently for practical purposes after a certain amount of boiling, but whether this method of purifying can be made practicable and cheap is a question which we cannot from our own experience determine. We are not prepared to believe that chemical means alone can be economically employed for the precipitation of the materials in water which form incrustations; but to this we shall again refer. A subject which has so long baffled the skill of the leading scientific and practical minds at home and abroad cannot be properly treated without reaching in vain after the necessary data to make the article wholly reliable and conclusive. We think so great an evil as boiler incrustations, involving in its range violent explosions, loss of life and great destruction of property, should have the combined effort of scientific and practical men toward the development of a remedy; and, to this end, your Committee, fully realizing the extreme difficulties of the subject, have invited the co-operation of eminent chemists and scientists; and from them they have not as yet obtained anything sufficiently definite to warrant its presentation; and hence they feel that the only way left open to them by which they can discharge their duty to themselves and the Association, who have honored them by their appointment for this particular office, is to present their own crude and imperfect ideas and experiences for what they may be worth. It was thought that enough was said upon this subject last year to stimulate an interest on the part of railway companies in the matter of purifying water before using it in their engines, but we have failed to hear of any experiments in that direction.

Your Committee do not believe a remedy can be devised without more or less experimenting, all of which must necessarily be attended with considerable expense; but they will endeavor to show that at least some economy may be the result.

The plan, which we shall attempt to explain, is one which we believe will nearly if not quite purify the water before it is taken into the boiler, and it is yet hoped, by the introduction of chemical agents, that this method may be simplified and prove practicable and cheap. Not having tried any experiments in this direction ourselves, we shall be confined to the experience of others to prove our theory, and will first refer to a paper prepared as a report of experiments made by Professor C. F. Chandler, of Columbia College, New York, to the President and directors of the New York Central Railroad Company, upon the various kinds of water used by the locomotives of that company along the line of its road, with an analysis of the waters, showing their composition, and also an analysis of the scale formation from such water, and what chemical agents and processes would decompose and prevent the same. The report was read before the American Institute Polytechnic Association January 11, 1866. The following article appears in this report:

"Boiling expels the free carbonic acid and causes the separation of the carbonates of lime and magnesia, and if conducted at a high temperature, under considerable pressure, results in the almost complete precipitation of the sulphate of lime. This would, however, merely transfer the incrustations from the locomotive boiler to some other vessel, and would therefore be valueless in this case."

This is just what we desire to do, transfer the incrustations from the locomotive boiler to some other vessel provided to receive it, and so arranged that the sediment may be removed at pleasure. There supervenes a difficulty in the use of chemicals for precipitating the lime, etc., from the water which seems to offer two insuperable objections. The first found is in the nature of the chemicals used; for, while precipitating the matter forming incrustations, they may corrode the metal itself. All chemicals would have to be used to purify the water before entering the boiler, in order to avoid this corrosion and also the precipitation into it, which would still demand cleansing of the foreign matter. Then a second objection arises out of the wide differences of water in the different sections; while incrustations are formed from those which contain lime, yet there may be, and is, such a difference of chemical admixture as to render it wholly impossible to find any one universal chemical sufficient to dissolve these different elements. Hence we feel the necessity of looking somewhere else than to chemical solvents alone for a solution of the difficulty.

If Professor Chandler's theory be correct, an apparatus can be easily arranged at each water-tank along the line of the road, by which the water may be heated, and if desired, subjected to a pressure, before being taken into the locomotive boiler. From his statement we may assume that the impurities in water will precipitate at a temperature of 212 degs. If this be true, the best and cheapest method of heating the water to this temperature, and its treatment after being so heated, only remain to be proven, and your committee would suggest the following plan: Let each watering station on the line of the road be provided with a pumping engine or steamp pump, with a capacity in proportion to the amount of water required. The exhaust steam from the pumps should be conducted into a suitable heater, together with as much live steam as may be necessary to raise the water to a boiling heat. The heater being closed, the water within it at the boiling point would be subjected to a pressure of 15 lbs. to the square inch. The heater should be made of iron, and as large, perhaps, as one-third the capacity of the tub. While the heater is being filled, the water should be raised to the boiling point, after which the calcarious and other matter in suspension should be allowed time to settle, when the water can be drawn off into the tub arranged to receive it. After the heater is emptied the sediment may be blown off, and this process repeated until the tub is filled, thus keeping up the supply of purified water according to the demand.

The expense attending this apparatus would be equal to the cost of a No. 4 Knowles' steam boiler and pump complete—$450.00; together with the heater and its fixtures all told would not exceed $1,000.00; and deducting from this amount the value of the present machinery employed, consisting of one ordinary horsepower and and a 4-inch hand or power pump, would make actual expense of first cost at such watering station about $800.00. The second cost, or continual expenses, may be estimated in proportion to the amount of fuel consumed for the purpose of heating the water. Assuming as a basis that one pound of coal will evaporate 8 lbs., or one gallon of water, we would only have to estimate the amount of coal consumed to arrive at the approximate consumption of water. It has been proven by experiment that if five and a half pounds of water, at a temperature of thirty-two degrees, be placed in a vessel communicating with another one in which water is kept constantly boiling at the temperature of 212 deg., until the former reaches the temperature of the latter quantity, and is then weighed, it will be found to weigh six and a half pounds, showing that one pound of water has been received in the form of steam, through the communication, and reconverted into water by the lower temperature in the other vessel. Now this pound of water received in the form of steam had, when in that form, a temperature of 212 deg. It is now converted into the liquid and still retains the same temperature of 212 deg., but it has raised 5½ lbs. of water from this temperature of 32 deg. to 212 deg., and this without losing any temperature of itself. It follows, then, that in returning to the liquid state it has parted with 5½ times the number of degrees of temperature between 32 deg. and 212 deg., which is equal to 180 deg., and $180 \times 5\frac{1}{2} = 990$ deg. Now this heat was combined with the steam, but as it is not sensible to a thermometer, it is called latent heat. It is shown, then, that a pound of steam, in passing from a liquid at 212 deg. to steam at 212 deg., receives as much heat as would be sufficient to raise it through 990 thermometric degrees; if that heat, instead of becoming latent heat, had been sensible, and 990 deg. $\times$ $2,120 = 1,202$ degs., being the whole amount of heat in steam. Hence it will be seen that one pound of coal, capable of evaporating 8 lbs. of water, will raise to the boiling point about 5½ times as much, say 44 lbs. or 5½ gallons of water. To this must be added the relative value of the exhaust steam from the pumping engine, which will be equal to 5½ times the amount of water evaporated in pounds. Supposing, for example, that one locomotive running 2,600 miles a month, or 31,200 miles a year, will make 45 miles to one ton of coal; it would then consume 693 tons of coal per year, at $2.50 = $1,732.50. If this locomotive will evaporate six pounds of water to one pound of coal, it will require 8,316,000 pounds, or 1,039,500 gallons of water. It is estimated that a No. 4 Knowles steam pump will raise 5,940 gallons of water an hour. In doing this work it will consume about 60 lbs. of coal, requiring 10,500 lbs. to pump the whole amount of water. If the pumping engine will evaporate 8 lbs. of water to one pound of coal the exhaust steam will boil about 5½ times this amount, or 44 lbs. of water to one pound of coal, equal to $10,500 + 44 = 462,000 \div 8 = 57,750$ gals. This would leave 981,750 gals. to be boiled by the use of live steam from the boiler, which will require one pound of coal to 5½ gals. of water, or $981,750 \div 5\frac{1}{2} = 178,500$ lbs. coal $\div 2,000 = 89\frac{1}{4}$ tons. This, added to the amount of coal required to pump the water, would make about 94$\frac{1}{4}$ tons at $2.50 = $236,25, total expense for fuel in purifying the water in one engine for one year. Boiler repairs, including machinists' labor in taking down and setting up machinery that would not be otherwise done, would amount to about $550 a year. Of this amount fully 65 per cent. may be due to incrustations alone. Judging from reports received by your committee from Eastern and Southern roads using water from which no incrustations form, where boilers run from 15 to 27 years without repairs, it may be safe to assume that even 75 per cent. will be saved by the use of pure water. But granting that only 65 per cent. is saved, the actual cost of boiler repairs due to incrustation would then be $357.50.

We will now consider the extra amount of fuel necessary to heat the water through the increasing formation of incrusta-

tions, which we will attempt to illustrate as clearly as possible, from the best information we have been able to gather from both theory and practice. Dr. Joseph G. Rogers, in a paper on steam-boiler water and incrustation, before the American Association for the Advancement of Science, says: "The evil effects of scale are due to the fact that it is relatively a non-conductor of heat. Its conducting power compared to that of iron is as 1 to 37.50. This known, it is readily appreciated that more fuel is required to heat water through scale and iron than through iron alone. It has been demonstrated that a scale $\frac{1}{32}$ of an inch thick requires the extra expenditure of 15 per cent. more fuel. As the scale thickens the ratio increases. Thus, when it is $\frac{1}{4}$ of an inch thick, 60 per cent. more is required; at $\frac{1}{2}$ inch, 150 per cent., and so on. To raise steam to a working pressure of 90 pounds, the water must be heated to 320 deg. Fahr. This may be done through a $\frac{1}{4}$-inch iron shell by heating the external surface to about 325 deg. If a $\frac{1}{2}$-inch scale intervenes, the boiler must be heated to 700°, almost a lowrett heat. The higher the temperature at which iron is kept, the more rapidly it oxidizes, and at any temperature above 600° it soon becomes granular and brittle, from carbonization, or conversion into the state of cast iron. Weakness of boilers thus produced, predisposes to sudden explosions and make expensive repairs necessary."

On most of the Western roads incrustations will form to a thickness of from $\frac{1}{4}$ to 3-16 of an inch in the course of one year, and increase at a still greater ratio, as long as the engine is kept in service. Thus after four months time there will have accumulated in our engines nearly 1-16 of an inch of scale. This statement will be verified, by a specimen presented for your inspection, consisting of a piece of 2-inch flue taken from an engine on the Hannibal & Joseph Railroad after three months' service, to which is adhering a scale nearly 1-16 of an inch thick. If Dr. Rogers' theory be correct, after one month's service. our engines will consume 3$\frac{1}{4}$ per cent. more fuel than at first; after two months, 7$\frac{1}{2}$ per cent., and so on; making an average for the year of over 20 per cent. more fuel than they would have consumed if using pure water. This, according to the performance of the best coal-burning engines, making 45 miles to one ton, will amount to an extra expenditure in fuel of not less than 138$\frac{1}{2}$ tons, at $2.50, making $346.25 due to incrustations. This being added to the expense of repairs due to incrustations, will make $703.75. In addition to this, the expense of washing boilers may be counted; as by the use of pure, clear water boilers would seldom require washing, and the expense of at least one dollar per week, or $52 per year, would be saved to each engine, swelling the total to $755.75, or $519.55 more than the cost of purifying the water by this process. From this, it will be observed, that to boil sufficient water to supply a locomotive for one year, running 31,200 miles, will require the extra expenditure of $236.25 for fuel. Now if boiling alone will purify the water, there would be a saving of $519.50 to each engine, or $51,950.00 for 100 engines. Besides all this, the use of pure water will absolutely prevent all manner of explosions, ruptures, and leaks, arising from the effects of incrustations. It will also save a large proportion of the repairs to the machinery, not counted in the above estimate, by always supplying the cylinders with pure, dry steam of the best quality, free from loose sediment or grit, which always follows the course of the steam, frequently cutting the valves, pistons and cylinders, and otherwise damaging the machinery of the engines. The use of water, free from mud and organic substance, will absolutely prevent the evil of foaming, which so frequently almost unfits an engine for usual services, until it can reach its destination and be washed out. This and many other prolific evils arising from the use of impure water would, beyond a doubt, be entirely overcome. The introduction into a boiler of any so-called remedies, be they baltorics, powders, fluids, or any other nostrums, can hold no comparison whatever to this one perfect and only reliable remedy. Any experiments toward the providing of pure water for locomotive use is a step in the right direction, and when railway companies are aware of the fact, that in the Middle and Western States the expense due to impure water and incrustation would amount to the enormous sum of about $75,000 a year for every 100 locomotives, we think they can afford to give the subject a little consideration, with a view to making some practical experiments by which reliable and satisfactory results may be reached. The matter of thoroughly purifying the water at a moderate expense is so extremely difficult that your Committee are not prepared to suggest any particular plan, other than that already recommended, believing that nothing in this direction can be definitely known without more or less experimenting.

Mr. Towne, of the Hannibal & St. Joseph Railroad, has been investigating for the past two years with an apparatus, consisting of an ordinary dome, 25 × 25 inches, riveted to the top of the boiler, in a convenient locality to the pumps of the engine, so that the water supply can pass freely through the check pipes to the top of the dome, where it is discharged and caused to fall upon and ripple over a series of heated plates. circular in shape, provided with a series of ribs or stops on their upper surface to retail the momentum of the water and arrest the sediment as it passes from one plate to another in its course to the boiler. After passing over these plates the water forces its way through a filter, thence to the boiler through a number of one inch pipes (as per tracing), through which, also, steam from the boiler is admitted to the dome, distributing itself around and within the heater, maintaining a constant equilibrium of heat between the apparatus and the boiler. Half of these plates are slightly convex and half concave, causing the water to flow from center to side and side to center alternately, passsing through holes or slots in each plate on its way to the filter, and finally to the boiler through said pipes, which extend upward about five inches, forming on top of the boiler (within the heater) a basin for water and a receptacle for any sediment that might lodge there, whence it could be blown off by means of pipes arranged for the purpose.

The filter was composed of course gravel, and soon found to be of no practical use, beyond the lodgment of more or less incrustation. The shelves were found to gather from 1-16 to 3-16 of an inch of incrustation in from 6 to 12 weeks time, showing clearly that the principle was correct, but the apparatus entirely too small to arrest all the lime, as the boiler and flues were also found to be thickly coated; especially so directly under the heater, where the water had fallen upon the flues, scale had formed from $\frac{1}{4}$ to $\frac{1}{2}$ of an inch in thickness. After running this engine about sixteen months without any satisfactory results, beyond that already stated, it was taken in for temporary repairs, and the heater re-arranged with a view to getting the greatest possible amount of heating or plate surface within its capacity. The filter was accordingly taken out, and the boiler cut out to the size of the internal diameter of the dome, and an additional number of plates put in, about 1$\frac{1}{2}$ inches apart, filling the dome full, making 16 plates in all—a plate surface of about 50 superficial feet. In addition to this, a circular strip of sheet iron four feet long was placed inside the boiler, directly under the heater, its ends being flanged upward about two inches, filling the circle of the boiler, and its sides extending downwards to within a few inches of the bottom of the boiler. This was to prevent the water from the heater coming in contact with the flues, and also to provide a still greater heated plate surface, over which the water must travel before reaching the boiler, making, all told, about 82 superficial feet of heating surface. The engine is now running with this apparatus, and although it arrests so much lime and mud that it is found necessary to take out the plates and clean them off occasionally, yet it does not seem to stop all the incrustations, and consequently it is not just the thing. Judging from these experiments, as well as others, we do not believe that any apparatus of this kind can be gotten on to an engine of sufficient capacity to purify the large amount of water required for a locomotive boiler. We think the same device, or a similar one, arranged at watering stations along the line, on a larger scale, might be made to do the work effectually, at less expense perhaps for fuel than the first plan. If not by that alone, the introduction of chemical assistants, at a trifling cost, might have the desired effect. The first plan, however, would seem to be the most feasible. The importance of this subject cannot be overrated since it is known that among the many evils of incrustations none are more potent than the fact of boiler explosions from this cause, and nothing can be surer than pure water as a remedy for this class of explosions. There are cases of explosions of boilers at present that, without proof to the contrary, may be taken to be very much below their power to resist pressure, showing very clearly that boilers do explode from causes yet unknown. It is then reasonable to suppose, since the fact is not known, that impure water and incrustations may be the source of this unknown element of destruction. Should it be, however, only one cause of such terrible disasters, one point will have been gained; for a single remedy absolutely known is worth more than all the speculative theories extant, as it may lead to the development of a final cure, and in time boiler explosions, other than those caused by low water and over pressure, will no longer be a mystery. In conclusion, your Committee feel that they are groping in the dark, and cannot conceal from themselves what must be apparent to others, that the question is yet an open one; and whether the theory advanced will effect a complete solution of the difficulty yet remains to be proven by actual trial. To this end, we would respectfully invite the attention of all interested, and recommend a series (if possible) of exhaustive experiments, without which they are convinced nothing definite in this direction can ever be known.

Respectfully,

H. A. Towne, H. & St. Jo. R. R.,
J. Johann, P. R. R. of Mo.,
J. M. Boon, P., Ft. W. & C. } Committee.

H. A. Towne, Chairman.

In connection with this report the following letter from J. H. Setchel, Little Miami Railroad, was submitted and read:

MR. J. H. SETCHEL ON BOILER INCRUSTATIONS.

H. A. Towne, Esq., Chairman Committee on Boiler Incrustations:

Dear Sir: Originally the water on this road was all very hard; but since the introduction of coal as a fuel, the necessity for soft water has been so apparent that strenuous efforts have been made to obtain it. At Cincinnati, the water of the Ohio river is used, and but little incrustation is found in boilers using this exclusively; and even after engines have run on other divisions and have become heavily scaled, a year or two's use of this water will in a great measure remove it. At Columbus, the water of the Scioto river is used, and with about like results. Within the two points named, where the water is mostly taken from wells, it is highly impregnable with lime, forming on flues and boilers a hard, flinty scale. On one division of 57 miles, we have more trouble than on any other part of the road. Here the water is taken from wells, and is very hard. And in running this division we can take engines upon which we are required to do more or less flue work every few weeks, and by transferring them to the main line, we are enabled to run them without difficulty. I can account for this only on the score of the difference in the quality of water used. We do not take out flues for the purpose of cleaning them, but run them as long; as they can be kept tight. Copper flues in engines burning wood will run from 150,000 to 200,000 miles. Iron flues in engines with coal as a fuel will average from 50,000 to 80,000 miles. We find that the life of the bottom part of boilers seemingly varies with the quality of iron used. We sometimes find a new boiler eaten out in spots in the bottom part after running three years. This I attribute to some extent to the rough places often left in iron by using too much sand in the rollers while the iron is in process of manufacturing. In forming sheets into shape, this sand that has been pressed in the iron often drops out and leaves a thin, rough place in the sheet, to which the scale adheres and enters on the work of destruction, and subsequently forms the eaten places for which the bottom sheets are taken out. I know the destruction of the bottom part of boilers is often attributed to scale and vegetable matter held in solution in this part of the boiler. But when you learn our method of cleaning boilers, I think you will agree with me that this can hardly be the case here. I have tried most all the "sure remedies" for preventing and removing scale that has been in vogue for the last five or six years without any positive good result. I have used John Bull's scaling powder in boilers that were thickly coated, and have found that it will remove scale to a noticeable extent. The engines would steam better and large quantities of scale and mud would be taken from the wash-out plugs for awhile; but in my experience I find that at certain seasons of the year our boilers will scale more or less without any artificial means being used. Our freight engines are run 120 miles four days in the week. This gives two layover days, and on one of these days the water is let out of the boiler when comparatively cold, and the bottom part of fire-box is thoroughly cleaned of all mud and scale. A 2-inch hand-hole plug is placed at each corner of fire-box that readily admits of the introduction of rods, and has nozzles for this purpose. In the front end, at bottom of flue-sheet, is another hand-hole plug, large enough to admit of a rod with auger or hook-shaped end. Once every two weeks this plug is removed, and the cylinder part of the boiler is thoroughly washed, together with the leg of fire-box as before. This process keeps the boilers free from mud, but does not, of course, prevent the formation of scale. To effect the latter, I have tried almost everything. Of the mixtures to put inside for the purpose of removing scale, I have found none better than the one before mentioned—"John Bull's." I am now experimenting with Hays' "Galvanic Battery" on three boilers; but it has not yet been in use a sufficient length of time for me to form any opinion as to its merits. I know of nothing that will effectually prevent the formation of lime in boilers. I should think that where water is used containing sand or vegetable matter in solution, a filter might be useful in arresting such impurities. Some years ago we were a great deal troubled by the filling up of the space between the crown-bar by deposits of mud and scale. But since the practice of giving an inch clearance under the bar has been adopted, and the quality of water been improved, we have little or no trouble from this cause.

Respectfully yours,

J. H. Setchel,
Master Mechanic Little Miami Railroad.

Mr. Chapman, Cleveland & Pittsburgh Railroad—I would suggest the propriety, at this time, of appointing a committee to determine the time and place of holding the next annual meeting; and would make a motion that a committee of five be appointed by the chair.

Agreed to; and the following committee was appointed: Mr. Philbrick, Maine Central Railroad; Mr. Brwon, Erie Railway; Mr. Woodcock, Central Railroad of New Jersey; Mr. Keeler, Flint & Pere Marquette Railroad; Mr. Flynn, Western & Atlantic Railroad.

Mr. Jackson, Rome, Watertown & Ogdensburg—If my recollection serves me right, there is no committee on mileage and the wear of tires. I think that question is a very important one. We want to watch these steel tires, from year to year; and it seems to me as though we ought to keep that up every year. I move that there be a committee appointed, upon the same questions sent out a year ago, so as to keep up the mileage of these tires, and keep the track of them. Agreed to: and Mr. Lauder, Northern Railroad; Mr. Studley, Concord Railroad; and Mr. Griggs, Worcester & Nashua Railroad were appointed.

DISCUSSION ON BOILER INCRUSTATION.

Mr. Coleman Sellers—This subject of incrustation, is one of great importance, and one that has interested me for a number of years. I would state in regard to the formation of incrustations, that it occurred to me that a microscopic examination of the sediment formed in boilers might be of use. With a view to this I went into an extensive series of examinations with the best appliances, and with various machines for reducing the sediment to a transparent condition. I investigated the formation of the crystaline deposit, and found, in a majority of cases, the same form of material seemed to hold with different kinds of deposits. I am sorry to say that the investigation, extending over a number of years, did not result in any practical elucidation of how the trouble might be avoided; but thinking of the matter, in reference to the possible appliance of some machinery to effect the purification of the water, that of boiling naturally occurred to me. I am pleased with what the committee report on the subject; but it seems to me they don't take into consideration the element of time that is necessary. The formation of deposits is almost the same as that of rocks, as they were originally formed. Those were formed under pressure and heat, but they had the element of time. The mere heating of water under pressure does not get rid of these deposits. It would have to remain an appreciable length of time; and this length of time would entirely preclude the possibility of that being used at stations, as a means of purifying the water. Then, if water could be made entirely pure, it is doubtful whether it is of any use. On the ocean steamers they use distilled water; and, on one trip, it wasfound that it was so deteriorating the boiler as to be of no service at all. The difficulty was got over by receiving in, every day, a certain quantity of salt water. It may be that pure water is more ready to take up substances than water partially saturated with other substances. Whether that is so, I cannot say; but it seems to me, where pure water has been used, there has been a more rapid deterioration than with water impregnated with salts or other substances. In the southern part of Illinois, a series of experiments is being tried which may throw some light on this subject—a series of experiments towards getting the lime out of the salt wells. They want to separate the lime; and the same experiments may eventually be used for this other purpose, and probably, by the time of another meeting of this Association, some light may be thrown upon this matter.

Mr. Fry, Grand Trunk Railway—I would call the attention of the meeting to the importance of the remarks made by Mr. Sellers yesterday, speaking of the Institute of Technology; and I would propose that the Committee be requested to correspond with that Institute, and ascertain whether, if they sent specimens of water from the West, or specimens of the sediments formed, the Institute would experiment upon those waters and try to give us some information. It may be difficult, perhaps, to get the railroad companies to expend large sums of money in employing chemists, but Mr. Sellers informed us that he thought the Institute would even be glad to receive water upon which to experiment; and, if so, it would be very valuable to us, there being but few of us who are competent ourselves to investigate, scientifically, the constituents of water. I propose that the Committee be requested to correspond with the Institute, and request them to experiment upon some of our water for us.

The President—We have no Committee on Incrustation next year, unless the Committee be first ordered.

Mr. Forney—One of the subjects for discussion includes the purification of water, which I presume would cover the subject of incrustation.

Mr. Towne, Hannibal & St. Joseph—This matter of simply sending samples of water to be chemically tested and proved, to find out what the water contains, is all very well, so far as it goes. We know all the water in the West contains more or less of incrustation; more lime probably than anything else; but no two roads have the same formation of incrustation. Most of the roads have more or less lime. Illinois, Wisconsin, Iowa, Nebraska, have more or less of the alkaloid formation. Missouri has some iron; that you all know is a very great mineral State. With water in which there is more or less iron, the formation of incrustation is very hard, very much harder to do away with than that of lime. The formations of the Hannibal & St. Joseph are principally lime and sand incrustations. That comes from the water in the Missouri River, and along its bottom, and is quick sand and lime to a very great extent. The simple matter of having these waters analyzed don't get at the point at all. We want to find out what will prevent this incrustation, and keep our boilers clean. It is said that pure water is injurious to the boiler. That may be so, but I never knew of the fact before. If that is the case, it will be well then to find out what sort of impurities it is necessary to add to pure water, to act in connection with the iron, and prevent this formation or deterioration of the iron by the use of pure water. Until we can get at some theory or practical plan of purifying the water, and preventing this water, that contains these impurities, from getting into the boiler and forming this incrustration, we are bound to have this trouble. As stated in the report, incrustation will form to a thickness of 1-16 of an inch in three or four months, on our flues. It takes, according to Dr. Rogers' theory, about 7$\frac{1}{2}$ per cent. more fuel to heat water through this formation or incrustation, after three months, than it did at first; and so on, until finally it makes 20 per cent. more fuel necessary to heat the water through this formation than it would using pure water, or where is no incrustation at all. In connection with the lime in the water, we have a great deal of mud coming from the surface water. The mud in itself, perhaps, could be gotten out, or would do little harm; but there seems to be just lime enough in the water to harden this mud and form incrustation. I have samples here showing the effect. This is perhaps $\frac{1}{4}$ lime; just enough to make the mud hard and prevent heating the water through the formation. If an analysis of the different waters of the different roads could be arrived at, there is no single remedy that could be applied to the different formations. Simply an analysis of the water of one locality would not do. We should have to have an analysis of the different wells along the line of the road. We have one place where the waters contain a large portion of fire clay and sulphur, making a very hard and solid formation. I have a sample also of that. This water comes through a coal mine. The boilers in that coal mine seldom last more than two years at the best. The impurities contained in the water eat the iron away and destroy it in a very short time. There is really no end to the subject of incrustation. The Committee on this subject have consulted all manner of publications, and I have corresponded with several of the best chemists in the country, and have failed, in every instance, to get any satisfactory solution of the matter of preventing incrustation. We all know that a locomotive boiler is so constructed that it is very difficult, after the incrustation is loosened by mechanical means, for batteries or anything of that kind to get that incrustation out of the boiler; it is, in fact, impossible; consequently, it lies there. If you commence to take out a portion of the flues, at the bottom you find mud. Sometimes they are nearly half full of mud, packed solid. In some instances, where we have used perforated pipes running through the boilers, a portion may be removed. The steam passing through these perforated pipes will take up as much of that mud as the eddy produced by the suction will draw, and perhaps take out some, but it will not take it all out.

We stop our engines every six months for the purpose of cleaning out the boilers. With the exception of this, we make it a practice to clean regularly with a force pump, which takes it out very nicely; but that don't prevent the formation of incrustation. The mud is about as much trouble as incrustation. It is a difficult subject to handle. I wish some other committee would be appointed on this subject, to give them a chance to take hold of it; and I would like to hear from other members of the Convention in regard to it.

Mr. GREGG, Erie Railway—Mr. Towne has just suggested that some other committee take hold of this subject. I think it would be a great mistake to have another committee take this subject up just where our last year's committee have left off; for the reason that they undoubtedly have given it a great deal of labor and attention to arrive at the conclusions they have, and produce such a report as they have presented here to this Association this morning. If a new committee on boiler incrustations or water impurities take up this subject, in all probability they will go over a great deal of the same ground and arrive at the same conclusions that the former committee have; while, if the present committee is continued on the subject, they will go forward with their labor and secure information that will be very valuable to us; and hence, I think it would be an advantage to this Association if our former committee—that is, last year's committee—were continued on this same subject of boiler incrustation, regardless, however, of whatever information the committee on water impurities may bring forth. It has been suggested that there is a committee on that subject already, but I do think it will be a great advantage to the Association to have the former committee on this subject continued. They have secured a great deal of valuable information which a new committee will have to go over the same ground to secure, and we shall be no better off the coming year than we are now. This subject is one of the greatest importance to all railroad companies and to us, as master mechanics; and, if it is consistent, I move that the committee be appointed on boiler incrustations.

Mr. FRY, Grand Trunk Railway—Before putting the question, it may be well for me to explain a little further my object. The same matter that Mr. Towne mentioned occurred to me—the difference in the different waters of the country; and at first I thought of requesting that a sample of each kind of water should be sent. Then I remembered that most of our Western waters produce a sediment, and that our Western men are noted for their energy, and I thought that the Institute might be sorry that they corresponded with us as car-load after car-load of sediment and hogshead after hogshead of foul water were deposited at their doors, and think that they had corresponded with us to no good purpose. The Institute have paid us the compliment of inviting us to come and see them, evidently recognizing our importance as a practical body of men, and I thought it would be a return of the courtesy for us to acknowledge their scientific acquirements and request them to assist us in matters about which we cannot understand a very great deal. They might possibly, by analyzing the water, suggest certain experiments which would not occur to us; and we could try those experiments, and when we get the practical working men in the country to work in harmony with the scientific men in our institutions, we shall have arrived at a very happy state of affairs. I think it would not be courtesy to allow their invitation to pass without some return of this kind, and if it meets with the spirit of the Convention, I hope some little notice of that kind will be taken. I, however, think that a few samples of the waters at different points along our Western lines would be sufficient. Whether another committee is appointed or not, I think is a matter of secondary importance.

Mr. HAYES, Illinois Central Railroad—Before the close of this discussion I have a word or two to say upon the subject of incrustation. Some of the gentlemen here have stated that perfectly pure water will destroy a boiler more than water with a moderate amount of solid matter. However that may be, I don't know, but I somewhat doubt the truth of the statement. Some years ago, when connected with the Baltimore & Ohio Railroad, we ran engines from Baltimore to Washington; they passed through a country that was very sandy; most of the water came through sand heaps and was supposed to be very pure. With that water we could run for six months and not make a deposit on the boilers as much as we in the West—going through Illinois and Wisconsin and the adjacent States—will make in one week. We scarcely ever washed out a boiler between Baltimore and Washington more than once in six months. It is a hard matter for us, sometimes, to run more than one week without washing out. We all know that when pure running water is used in boilers, you may use them almost for an indefinite time. It is a question in my mind whether this water that you distil out of the sea water is perfectly pure. I think you still retain a portion of the salts in that water. Whether that is correct or not I am not chemist enough to say, but this much I do know: where we have used pure water out of the mountains on the Baltimore & Ohio Railroad, or from the sandhills between Baltimore and Washington, we could run boilers for an indefinite time without any injury, or scale or formation in the boilers. Out in the Western country the water is principally lime and magnesia and silica. That is the principal portion of the incrustation formed in our boilers. Now, if we can get something that will take those three articles out of the water, we have what we could call comparatively pure water, although chemically speaking it may not be pure, and we could then get along, I have no doubt, with 25 per cent. less of expense in repairs of boilers—and I will say also of machinery—because when an engine is brought in for repairs of the boiler you almost invariably tear down machinery which might run for six months longer, if you had pure water in your boilers before it came in for repairs. Now we have used in Chicago on our stationary engines an apparatus patented by a German in our State. It is a very imperfect apparatus, but it is a question in my mind whether it will not lead to something which is very valuable to railroad companies. It is simply a tub, 4 feet in diameter and 6 feet high. It is filled with iron, promiscuously—with pieces of iron of different shapes—and the exhaust steam passes up through that iron, and the water is received upon the top and led in small jets down from that iron as the exhaust steam comes in contact with it passing up. In six months we get that thing filled almost solid with those substances—lime, magnesia and silica—such as are contained in the water there; and we find that that boiler now, after running two years, has not as much deposit in it as we would have got in one month with the ordinary process. It is a simple process. Could not something of the kind be gotten up cheaply upon railroads, and be adopted to take this foreign matter out of the water before we receive it in the boilers? If that can be done (and I see no reason why it may not be), it seems to me some of our chemists who are better acquainted with the subject than I am could give us suggestions in regard to it that would be valuable. I formed my idea of this arrangement from reading the report of Professor Chandler upon the New York Central. He says it cannot be precipitated unless by a certain heat. In this apparatus we get that certain heat. He says if you do it in a separate vessel it is as expensive to get it out of that vessel as to get it out of the boiler. It is no expense at all to get it out of this apparatus I speak of. All you have to do is, when the engine stops, to take out these pieces of iron and throw them into the fire and put in another set. The fire will take this deposit off; consequently you must have two sets to throw into the vessel, and in this way you get all or nearly all the solid deposit out of the water. It was from reading that report that the thing was brought to my mind, and the idea suggested of making this experiment, although the original idea is from this German in Champaign County, in our State. After reading this report it struck me it would be a good thing to see if we could not use it upon railroads. We use it on the stationary engine, and have used it for three years, and it is doing good service, preventing, I might say, almost all incrustation in that boiler. It uses but 2½ tons of coal whereas when the boiler was full of this incrustation, it took nearly double that quantity of coal to run the same machinery. It seems to me, if it could be brought before the minds of railroad presidents and superintendents to appropriate a certain sum to go into these experiments, there might some good results grow out of it.

Mr. GREGG, Erie Railway—I have been interested in this matter of incrustation, having had considerable experience with that trouble. I don't want to hold this Convention with a long talk on this subject, but I would move that a vote of thanks be extended to our Committee on Incrustation, whose report we have just heard, very lengthy and exhaustive indeed, and that they be requested to continue for the coming year.

The PRESIDENT—A committee has already been appointed upon that subject, of which Mr. Towne, the Chairman, is the same. The other members have been changed. The committees are all arranged, and we have tried to arrange them so that there shall be no members upon two committees, and to pass that motion will disarrange the committees.

Mr. GREGG—My whole interest was concentrated in Mr. Towne, and I will withdraw that part of the motion.

The vote of thanks was then passed.

The SECRETARY—I wish merely to say that on the road I represent we are very much troubled with incrustation, and without making any further remarks I will just show you some specimens. That is what we get out of our boilers after five or six years' service. Get the right light on it and it fairly glistens; looks as though it was covered with diamonds. Here is some other scale that came from boilers using the Ohio River water exclusively. This piece came off from the flues, four or five feet from the end of the front flue-sheet. We take a great deal of pains with our boilers, never running a boiler over one week without washing it out. We have hand-hole plates in the bottom of the fire-box, and once a week they are taken out and water run through, and great care taken to get out all the mud and sediment that may be collected. Then the next week—there is a plug put for that purpose in the front flue-sheet, and that is then taken out and the barrel of the boiler washed out with rods, and every care taken to prevent the formation of mud and scale; and yet these deposits form sometimes very quickly. These, however, were taken from a boiler that had been in use six years since the flues were taken out. Here is another specimen, taken off from the side of the fire-box. I believe on our road we have tried almost everything that anybody desired to have tried for the purpose of preventing the formation of scale, and latterly we have been trying Mr. Hays' battery, and there is a piece of a flue taken out of an engine where the battery had been in use nine months. I confess I was very much disappointed. I had formed the opinion it would almost entirely prevent incrustation; but on taking this flue out, the incrustation, which I expected, if there was any formed, would be rotten, seemed firm—firmer than on other engines, and entirely covered. You see it is about 1-32 of an inch thick. That was formed in nine months. Here is a small specimen of a scale. I had a flue taken out of a boiler that had been in 18 months, and you see that it is hardly as thick again, and the appearance of the scale on the flue was very different from the appearance of this scale. Instead of its being firm and solid, in some places there was no scale at all on the flue; it was pitted all over; but the scale on these flues seemed to be hugging perfectly tight; not a spot but it was covered. I am utterly unable to account for it. Mr. Jauriet has written a communication to the Convention speaking very favorably of it indeed. He thinks it will be a perfect success, and that it will not only remove scale, but will prevent explosions. I think, perhaps, the subject is worthy of attention. The gentleman who put this on tells me he takes the blame to himself. He says he thinks he did not apply it right and did not attend to it properly. However, he had the whole matter in his charge, and if he did not we are not to blame for it. That is the result.

Mr. TOWNE, Hannibal & St. Joseph Railroad—In connection with exhibiting samples of incrustation, I would like to present this for the benefit of the Association, especially to the Eastern members who have no trouble with impure water. There is a formation principally from the water in the Missouri River; not directly from the river, however, but that percolated through the sands of the Missouri bottom. Our shops at Kansas City are located perhaps half a mile from the river. We use there what is called a "drive" well, or pipe well, to fill the tank there. All the water for the engines there at that point is supplied from this drive well. The water comes up with a great deal of quicksand, and this formation appears to be quicksand and lime. It is nearly two inches thick, having the form of the flue on one side. It formed between the outside flue and the shell of the boiler, about four rows from the top, in a place where we could not get at it to wash it out, and hence the formation. The boiler was washed once a week, sometimes twice a week; yet this formation grew up there in seventeen months' time. It was like that almost the entire length of the flue, from that to this thickness—that is ¾, and that is 2 inches. The flues all through the boiler were more or less coated. Some of them, where they were nearly half an inch to five-eighths of an inch apart, were nearly welded together by this formation. That was one engine; other engines troubled us the same way. Here is a formation of a different character taken from a stationary boiler in our shops at Hannibal. This was formed round three flues, welding them closely together. We used the Sillman filter, which is one of the best we have to prevent formation; but the one we have is not large enough. A good deal of this stuff gets through. The water is thoroughly heated, falls down on the filter and passes through without having time to settle. The result is, the mud and lime and impurities of the water pass on to the boiler and form this incrustation. I find in my experiments, and we all I think have discovered it, that it is quite as necessary to keep the mud out of the boiler as it is to do so with the mineral substances contained in the water. In reference to the Hays battery, it may prevent the formation of lime, but it certainly will not keep the mud out of the boiler. If it will crack off the lime it may do very well for a boiler that has the formation already on; it may break off the incrustation, and you can wash out a portion of it, but not all of it. We tried two of those batteries on the Hannibal & St. Joseph road. We had one of them on nearly a year, and one nearly eighteen months. I could not discover any beneficial results from the use of it. Perhaps we did not try it as we should have done. It was among the first that was used. We have never seen Mr. Hays at all, and don't know but he can put one on that will answer the purpose. If he can, I wish he would do so. To get any good results at all from the use of fuel, we find it necessary to wash out very often, and take out all the bottom rows of flues—12 to 20 flues—and give it a thorough cleaning. Our road is not any worse perhaps than the Illinois Central or the Chicago, Burlington & Quincy Railroad, that I know of. The roads on the line of the Missouri River realize the same difficulty—the Missouri Pacific, the Kansas City, St. Joseph & Council Bluffs and all other roads. In that report we refer to an apparatus I have been using for the last three years, nearly, for the purpose of purifying the water and extracting the lime and other impurities, and keeping them from getting into the boiler. I have here a model of the apparatus that I use. While it answers very well, so far as it goes, it does not do the work altogether, and, therefore, I contend it is not the thing. Neither do I believe you can get anything on a locomotive that will do it. This is a dome 25 inches in diameter by 30 inches high. It is filled full of plates an inch and a half apart. The water is conducted into the sides through the check valves. The water is fed through a pipe in the center up to the top of the dome with considerable force, strikes the top of the dome or dome cap, which adds to the heating surface somewhat, and by the time the water falls upon the first plate it is nearly boiling hot. I find that to be the case by testing it with a gauge or thermometer. There are sixteen of these plates. The water falls from the top of the pipe on to this plate, passing from this plate on to the second one, rippling along down until it falls down here. By this means, I think, perhaps, if the plates were sufficiently hot, we might stop this incrustation by gathering it up on these plates, and it does do it to a great extent. These plates we take out once in six weeks and clean them off. Sometimes there is a quarter of an inch of scale, and with all that we find it in the boiler and on the flue. I brought this simply to show—though I suppose it is as good a thing as there is in use (that is, I have not heard of anything that is better)—that it is not the thing altogether, and I don't know of anything that you can get on to a locomotive that will purify the water. I understand that Mr. Congdon, of the Union Pacific, has used a similar apparatus, but instead of having these plates (this dome is on the forward part of the boiler, over the check valve), he simply uses a basin instead of the dome, to which he conveys the water, and the water rises and flows over the top. He claims that will purify the water. I also understand that another gentleman on some road in Illinois is using substantially the same thing—Mr. Jackman; I don't know whether he is present or not. If so, I would like to hear from him. He also claims that that will purify the water. Those two gentlemen are both using the same thing or about the same thing, as near as I can learn. I have been using this for three years, and you have heard the result.

Mr. GORMAN, Toledo, Wabash & Western Railway—It may not be out of place here to mention a little case that came under my own observation in regard to purifying water. In 1864 I went down into Arkansas. They were building a road called the Mississippi & Ouachita road, and they had but one engine and didn't have any water tank to take water from, and consequently they stood on a bridge at a bayou there and pumped the water as it was required. That bayou was fed from the Mississippi River. I didn't like the place and didn't calculate to stay. I asked the foreman how long he had been there. My business was to run the engine and be chief cook generally. I asked the engineer how long the boiler had been running, and he said two years; he had been there all the time. "When was it cleaned out?" I asked. "Not for a year and a half." "My gracious!" said I, "the thing must be chock full of mud. This will not do if I stay here; I don't propose to let them burn the boiler up." I went to the Superintendent and told him if the water was anything like what I was in the habit of using, the boiler must be full of mud and I would clean it out if he would allow me to stop on Saturday. I expected to have a big job, that I should have to punch the hand-hole plates in and dig mud generally. I took the engine out and blew her off; got a punch-bar and got underneath and punched in the hand-hole plate and took off the nut. The hand-hole plate went right into the boiler. That astonished me. I reached in, and there was not as much mud in that boiler as you could hold in your hand, and not a particle of scale. The color of the iron was changed somewhat inside. It looked like the browning on a gun barrel. I put in the hand-hole plate, filled up the boiler and pried her up, and went up along this bayou. The water was very dirty and had a very offensive smell. The whole thing was filled up with all kinds of vegetable matter—trees, shrubs and leaves, and things of that kind. I had never seen anything like it before. When I came on my way back to Memphis, I stopped to see Mr. Fegni (I think that is his name), the Master Mechanic of the Memphis & Charleston road. I was anxious to find out what it was that kept that boiler in condition, and asked him if anything of that kind ever came under his observation. He said it had; he had a little bayou, and all he did when his engines got foul was to send them there to use that water, and it cleaned the boilers out. That water contained nothing but the vegetable acid that was in it. If any of the members know what was in it I would like to find out.

Mr. HUDSON, Rogers Locomotive Works—I think this subject is a very important one, otherwise I should hesitate to say anything (we have already had it so well ventilated) on the subject of preventing this deposit of scale. I had a little experience on a road where we used to be troubled with extensive deposits of lime, and we had a water station at one place on the road where the water was taken from a swamp, and when the boilers became foul we used to give them a pretty large dose of this water, and it invariably resulted in enabling us to wash out this deposit, that would otherwise have been very hard in a short time. What the particular material was that produced this result I don't know. I suppose that it was vegetable matter of some kind or other. I might state also we used to be in the habit of putting in occasionally, when we cleaned out the boilers, at times when we could not get sufficient of this water, chestnut bark or something of that kind, which enabled us to get rid of these deposits without their forming hard scales. I apprehend the solution of this question will depend upon the best method of preventing the deposit of hard scale. What we want to do is to prevent the deposit of hard scale. If we can do that before we put in the boiler so much the better, or, if we can do it cheaper by some apparatus on the boiler, that will be an advantage. I am impressed with the efficiency of something of the kind which has been illustrated by Mr. Towne. I think that or a similar apparatus was used on some of the German railways some years ago. I am not able to state from recollection how long ago, but my memory is very distinct of having read of an apparatus of that character placed upon the dome and provided with pans very much after the manner described by Mr. Towne. I do not suppose he is aware of it. I was very much impressed at the time with the feasibility of allowing the earth and sediment to deposit in those pans, which could be removed by cleaning them; and I think, if I recollect right, the road having this apparatus in use was in the habit of doing that once a week, or as often as might become necessary. As I said before, I am very favorably impressed with that method of getting rid of the sediment. I think we all know that the greatest deposit of sediment, especially among the tubes, takes place where the water is introduced; and if we can allow that matter to settle before we introduce it into the boiler, where it can be periodically taken out, we shall get rid of very much of the difficulty. There is another subject, however, in connection with pure water. I believe I stated yesterday that pure water, I was afraid, would fail to accomplish the result. I have no doubt upon that subject. I do know from some little experience in this matter that it will affect the metals of the boiler, rapidly eating them up, dissolving them, I suppose, chemically. There is another fact in connection with pure water. However, I don't anticipate any trouble from that. It is that it may be heated beyond the point at which ordinary water gives out steam, without giving out much steam, and then may suddenly give out the heat which is accumulated in it in a state of partial explosion. Whether any evil would result from that I am not prepared to say, although I think it would be very undesirable.

Mr. ROBINSON, Great Western Railway—Nothing has been said about the metals used in boilers, how far they affect the sediments on those metals. We know that brass tubes do not gather sediment so quickly as iron. I think steel fire-boxes do not gather it so quick as copper fire-boxes. I would like to ask this Convention whether there is any one here who has tried

steel fire-boxes of a thin construction. My impression is, the thinner we can use our material with safety, the better it would be for the accumulation of steam. My experience with tubes has been this: we have always used copper or brass, until lately, when we have used iron; and we find in running boilers 9 to 12 months, we get three times as much scale as on brass or copper tubes, necessitating the removal of a large number of tubes. For that reason we have abandoned iron and gone back to brass again. We can run four or five years without removing tubes, and in that time not get as much sediment as would be gathered on iron in one-quarter of the time. I would like to know if anybody has tried steel tubes. What we want to gather at this meeting is the experience of others from which we can save expensive experiments ourselves.

Mr. BOON, Pittsburgh, Fort Wayne & Chicago Railway—On our line we have steel, iron, copper and brass tubes; also steel, iron and copper fire-boxes; and we never could discover any difference in the amount of sediment. The amount is about the same. The amount on the iron would be a very little more, but it is so little as to be scarcely perceptible.

The report of the Committee on the "Comparative Performance and Cost of Operation of Eight and Ten-wheel Engines for Freight Service," was read in part, and, on motion of Mr. Lauder, received and placed on file; also report of Committee on "Comparative Performance and Cost of Operation of Ten-wheel Engines, with Six Drivers Coupled, and Eight-wheel Engines with Four Drivers Coupled."

REPORT ON COMPARATIVE PERFORMANCE AND COST OF TEN-WHEEL ENGINES WITH SIX DRIVERS AND EIGHT-WHEEL ENGINES WITH FOUR DRIVERS COUPLED.

To the American Railway Master Mechanics' Association:

GENTLEMEN: Your Committee appointed at your last annual Convention on the relative merits of the three classes of freight engines—viz., the six-driver engine with two-wheel truck, the six-driver engine with four-wheel truck, the four-driver engine with four-wheel truck—beg leave to submit the following:

We have received answers to our circular from about twelve master mechanics, the most of them expressing no opinion in regard to the merits of the different engines. Two are in favor of the six-driver four-wheel truck engine for roads with grades of 70 feet to the mile and under; but for very heavy grades and slow speed they would prefer the ten-wheel engine. As there are so few answers to their circular, the Committee ask your attention to the experience of the New York Central Railroad.

They have twelve "mogul" or six-driver and two-wheel truck engines and three ten-wheel engines.

Each class of engines (eight and ten wheelers) has been in all kinds of service, except passenger, and the most of the "mogul" engines are two years old. For all kinds of freight service they prefer the "mogul" at a speed of 20 miles per hour and under, and give as a reason that the "mogul" is easier on the track and not as hard on a curve as the 4-driver engines.

We also enclose with this miles run, cost in cents for repairs, weight of engine and comparative power of the "mogul" and 4-driver engines of the New York Central Railroad.

In the summer of 1870 the road was hard pushed for power on the Western Division, and two of the "mogul" engines were sent to help them out. They remained three months, and during that time hauled double the cars the 16x24in. 4-driver engines did. On the Rochester & Niagara Falls Division, 25 cars is a full load for a 16x24in. cylinder 4-driver engine, drivers being 5ft. in diameter, weight of engine 31 tons. The "mogul" engine No. 95, cylinders 18x22in., drivers 57in. in diameter, hauled 50 cars each way on that same division for three months and did not lose a trip during the entire time. ("Mogul" engine, 18x22in. cylinder, 50 cars; 4-driver, 16x24in. cylinder, 4-wheel truck-engine, 25 cars.)

The New York Central road also has 6 "mogul" engines 15x22in. cylinders, drivers 57in. diameter, gross weight 58,000 lbs., which are hauling the same number of cars as the 4-driver, 5 feet diameter, 4-wheel truck, gross weight 64,000 lbs.—both engines having the same pressure of steam.

The Chairman of your Committee is of the opinion with the experience he has had with the "mogul" engine, that the freighting on the New York Central road can be done for 35 per cent. less with a mogul engine 18x22in. cylinder, weight of engine 75,000 lbs. than with a 4-driver engine, 16x24in. cylinder, 4-wheel truck, weight of engine 64,000 lbs., for the following reasons:

1st. The mogul engine is carrying 75 per cent. less dead weight on truck than any other class of engine that use a truck.

2d. The weight is better distributed than it can be with any other build of engine.

3d. They are much lighter on the rail than other class of engines of the same weight.

4th. They will haul 33 per cent. more cars than a 4-driver engine—the cylinder, drivers and gross weight being the same.

5th. They are about 2,000 lbs. lighter on each pair of drivers than a 4-driver engine 4-wheel truck, both engines being the same gross weight.

In conclusion, he believes the "mogul" engine the best adapted to all kinds of freight service of any class of engines now in use, and your Committee fully agree with him.

COMPARATIVE STATEMENT

of mogul 6-wheel and 2-wheel truck; 6-wheel 4-wheel truck, and 4-wheel 4-wheel truck engines, New York Central & Hudson River Railroad.

No.	No. of Drivers	Size of Cylinder.	Mileage	Average cost per mile for repairs in cts.	Gross Weight lbs.	Cars Hauled.	Remarks.
9	6	15x22	43,600	.93	58 000	35	Mogul Engine.
22	6	15x22	43,500	1.34	58,000	35	" "
24	6	15x22	53,600	1.11	58,000	35	" "
42	6	15x22	24,335	2.	58 000	35	" "
309	6	15x22	43,600	1.	58,000	35	" "
310	6	15x22	42,560	.99	58,000	35	" "
13	6	18x22	54,515	2.04	75,000	50	" "
44	6	18x22	58,225	1.45	75,000	50	" "
95	6	18x22	58,070	1.61	75,000	50	" "
96	6	20x20	44,175	1.21	75,000	50	" "
105	6	18x22	35,000	.88	75,000	50	" "
163	6	18x22	26,914	5.07	75,000	50	" "
67	6	17x20	20,969	7.33	77,000	40	
188	6	17x22	39,900	5.36	77,000	40	
189	6	17x22	25,549	2.26	77,000	40	
261	4	16x24	38,400	8.44	64,000	38	
262	4	16x24	41.355	4.10	64,000	38	
263	4	16x24	32,996	3.22	64,000	38	
264	4	16x24	43,300	3.51	64,000	38	
297	4	16x24	34,067	5.41	64 000	38	
298	4	16x24	48,349	4.85	64 000	38	
299	4	16x24	36,243	4.59	64,000	38	
300	4	16x24	40,320	3.78	64,000	38	
301	4	16x24	38,919	3.82	64,000	38	
302	4	16x24	49,696	4.12	64,000	38	
304	4	16x24	39,734	3.19	64,000	38	
305	4	16x24	39 074	3.25	64,000	38	

Av. mileage mogul eng., 15x22 cyl., 41,866. Av. cost for repairs, 1.23
" " " " 18x22 " 46,150. " " " 2.04
" " 10-wheel " 17x22 " 28,806. " " " 4.98
" " 4-driver " 16x24 " 40,203. " " " 4.35

Dimensions of Engines.

Mogul—15x22in. cylinder; diam. of drivers, 47in.; 135 iron flues, 10ft. 6in. long, 2in. diam.; fire-box, 50in. long, 60in. deep; and boiler, 44in. diameter.

Mogul—18x22in. cylinder; diam. of drivers, 47in.; 146 iron flues, 11ft. 6in. long, 2in. diam.; fire-box, 65in. long, 60in. deep; boiler, 46in. diameter.

Ten-Wheel—Boiler, 46in. diameter; 145 iron flues, 12ft. long, 2in. diameter; fire-box, 60in. long, 60in deep.

Four-Driver—16x24in. cylinder; boiler, 46in. diameter; 145 iron flues, 11ft. 6in. long, 2in. diameter; fire-box, 60in. long, 60in. deep.

Mileage is for year ending September 30, 1871.

COMPARATIVE STATEMENT

Showing difference in our "Mogul" engines 6-driver, 5½in. diam., two-wheel truck, 18x22in. cylinder, 46in. diam. of boiler—146 flues, 11ft. 6in. long, 2in. diam.—firebox 65in. long, 60in. deep, and a 4-driver engine, 68in. diam., 4-wheel truck, 16x24in. cylinder, 46in. diam. of boiler—145 flues, 11ft. 6in. long, 2in. diam.—fire-box 60in. long, 63in. deep.

"Mogul" Two-Wheel Truck.	lbs.
Weight of engine with two gauges of water	75,300
Weight on truck	10,700
Weight on truck and first pair of drivers	32,900
Weight on truck and first and second pair of drivers	55,750
Weight on first pair of back drivers	19,000
Weight on first and second pair of back drivers	39,000
Weight on three pair of drivers	64,820
Weight of water in boiler (698 gallons)	5,912
Weight of empty engine	69,388
Weight of tender with 2½ tons of coal	40,350
Weight of water in tank (2,000 gallons)	16,940
Weight of coal	5,000
Weight of water and coal	21,940
Weight of empty tender	18,410

Four-Driver Four-Wheel Truck.	lbs.
Weight of engine with two gauges of water	65,970
Weight on truck	24,350
Weight on truck and main drivers	46,500
Weight on back drivers	20,400
Weight on both pair of drivers	41,700
Weight of water in engine	5,850
Weight of empty engine	60,120

Difference of weight of engines and on drivers:

	lbs.		lbs.
"Mogul—full weight	75.300	On drivers	64,820
Four-Driver—full weight	65,970	On drivers	41,700
Difference	9,330		23,120

Adhesive power—"Mogul" 1,600 lbs. per ton of weight on drivers, on dry rail, $\frac{64,820\times600}{2,240} = 17,362$ lbs.

Adhesive power—Four-Driver $\frac{41,700\times600}{2,240} = 11,170$ lbs.

Difference in favor of "Mogul" 6,192 lbs., 55.4 per cent. more adhesive power.

Power of "Mogul," in horse power, running speed of engine 20 miles per hour, steam pressure in boiler (per square inch) 25 lbs.; maximum pressure in cylinder, 60 lbs. per square inch; 125 revolutions per minute for 20 miles per hour; area of piston 254.4 square inches: $\frac{254.4\times60\times44\times125\times2}{33,000\times12} = 424$ horse power.

Power of Four-Driver engine, in horse power, running speed of engine 20 miles per hour, steam pressure in boiler 125 lbs. per square inch; maximum pressure in cylinder, 60 lbs. per square inch; 100 revolutions per minute for 20 miles per hour; area of piston 201 square inches: $\frac{201\times60\times48\times100\times2}{33,000\times12} = 292.36$ horse power.

Difference in power, 131.64 horse power—45 per cent. more in horse power mogul has over four-driver. For each engine making the same number of revolutions per minute (125 revolutions) the difference in horse power would be 16.33 per cent.

LETTER FROM MR. HILL, OF THE ERIE RAILWAY.

C. T. Ham, Esq., of the Committee on "Comparative Cost and Performance of Engines," etc.:

In regard to the comparative merits of the 8-wheel engine with six drivers connected, and 10-wheel engines with six drivers connected, I would say:

We have only a few of the latter class of engine, and they are all very old, and we are gradually wiping them out. In my opinion, there is no comparison between these two classes. I believe the "mogul" to be the best engine for all kinds of freight service—far superior to the 10-wheel engine, or the ordinary 8-wheel engine with four-wheel truck—if it is properly constructed.

I think Mr. Brown, our Master Mechanic at Jersey City, has given you a report on this subject, so that anything I might say would be only a repetition. Very truly yours,

E. O. HILL.

REPORT ON COMPARATIVE PERFORMANCE AND COST OF OPERATION OF EIGHT AND TEN-WHEELED LOCOMOTIVES.

To the Officers and Members of the American Railway Master Mechanics' Association:

Your Committee, appointed at the last meeting at Louisville, Ky., September 4, 1871, on the "Comparative Performance and Cost of Operation of Eight and Ten-Wheeled Locomotives," beg leave to submit the following report:

We have received replies to the printed circular of questions from 16 railroads, as follows:

C. F. JAURIET, Master Mechanic Chicago, Burlington & Quincy Railroad—Have 174 8-wheel and nine 10-wheel engines, averaging 20 tons of freight to each ton of engine. Average cost per mile run, in cents, for: Repairs—8-wheel engine, 11.61; 10-wheel engine, 12.77—switching. Fuel—8-wheel engine, 9.21; 10-wheel engine, 6.80—switching. Stores—8-wheel engine, .97; 10-wheel engine, 1.06—switching.

J. H. SETCHEL, Master Mechanic Little Miami Railroad—Have six 10-wheel engines. Can give no information to assist the Committee in making a report.

WM. A. ROBINSON, Mechanical Superintendent Great Western Railway, Hamilton, Ontario, Canada—Have 117 8-wheel engines, 23 6-wheel connected engines; 17 tons freight hauled to each ton weight of iron. Average cost per mile run, in cents, for: Repairs—8-wheel engine, 3.79. Fuel—8-wheel engine, 7.30. Stores—8-wheel engine, .823.

South Side Division Atlantic, Mississippi & Ohio Railroad—have 19 8-wheel engines. Average cost per mile run, in cents, for: Repairs—8-wheel engines, 4.28. Fuel—8-wheel engines, 9.30. Stores—8-wheel engines, 1.87.

WM. WOODCOCK, Master Mechanic Central Railroad of New Jersey—Have 29 10-wheel and 36 8-wheel engines; 8-wheel engines have 18 tons freight per ton of engine, 10-wheel engines have 17½ tons freight per ton of engine. Average cost per mile run, in cents, for: Repairs—8-wheel engines, 5.20; 10-wheel engines, 4.20 Fuel—8-wheel engines, 6.60; 10-wheel engines, 7.90. Stores—8-wheel engines, .01; 10-wheel engines, 1.10.

Received from Providence, R. I., with no signature or name of road: 18 8-wheel engines, 1 10-wheel engine. Average cost per mile run, in cents, for: Repairs—8-wheel engines, .015. Fuel—8-wheel engines, 1.55. Stores—8-wheel engines, .01.

SAMUEL M. PHILBRICK, Master Mechanic Leavenworth, Lawrence & Galveston Railroad, Kansas—We have 20 8-wheel engines. Average cost per mile, run in cents, for: Repairs—8-wheel engine, 3.4. Fuel—8-wheel engine, 5.1. Stores—8-wheel engine, 0.58.

J. B. GAYLE, Master Mechanic Raleigh & Gaston Railroad—We have 13 8-wheel engines. Average cost per mile, run in cents, for: Repairs—8-wheel engines, 8.43. Fuel—8-wheel engine, 37.09. Stores—8-wheel engine, .81.

W. G. FREEMAN, Master Mechanic Chesapeake & Ohio Railroad, Richmond, Va.—We have 3 10-wheel engines, 15 4-wheel-connected 4-wheel truck, and five with three connected drivers and pony truck. Average cost per mile, run in cents, for: Repairs—8-wheel engines, 5.93; 10-wheel engines, 6.21. Stores—8-wheel engine, .96; 10-wheel engines, .97.

S. J. HAYES, Master Mechanic Illinois Central Railroad—We have 185 8-wheel engines, which haul 20 tons per ton weight of engine. Average cost per mile run, in cents, for: Repairs—8-wheel engines, 8.42. Fuel—8-wheel engines, 5.94.

DAVID CLARK, Master Mechanic Lehigh Valley Railroad, Pennsylvania—We have 21 8-wheel engines; average number of gross tons to each gross ton weight of engine, 14.57 tons. Average cost per mile run, in cents, for: Repairs—8-wheel engines, 4.003. Fuel—8-wheel engines, 7.153. Stores—8-wheel engines, .663.

WM. F. RAY, Master Mechanic Toledo, Wabash & Western Railway, Indiana—We have 96 8-wheel engines; 504 tons in a train. Average cost per mile run, in cents, for: Repairs—8-wheel engines, 4.57. Fuel—8-wheel engines, 6.15. Stores—8-wheel engines, 0.80.

H. A. ALDEN, Master Mechanic Connecticut & Passumpsic Rivers Railroad, Vermont—We have in use on our road twenty 8-wheeled engines. Have had no experience with any others. Repairs—Average cost per mile—8-wheeled engines, .034.

J. W. PHILBRICK, Master Mechanic Maine Central Railroad, Waterville, Me.—Have 50 8-wheeled engines.

W. L. JORDAN, Master Mechanic Cumberland & Pennsylvania Railroad, Mt. Savage, Md.—Have 15 8-wheel engines and 7 10-wheel engines. Haul 160 tons cars over grade of 171 feet per mile with 10-wheel engines; 120 tons with 8-wheel engines. Average cost per mile run, in cents, for: Repairs—8-wheel, 25c.; 10-wheel, 6c. Fuel—8-wheel, 4½c.. 10-wheel, 4½c.

N. E. CHAPMAN, Master Mechanic Cleveland & Pittsburgh Railroad, Cleveland, Ohio—Have 51 8-wheel engines and 7 10-wheel engines. Can give no information as to number of tons hauled per ton of engine, having no data to work from. Average cost per mile run, in cents, for: Repairs—8-wheel, 3.46; 10-wheel, 5.45. Fuel—8-wheel, 5.04; 10-wheel, 6.59. Stores—8-wheel, 0.81; 10-wheel, 0.82.

These roads employ in the aggregate 865 8-wheeled and 68 10-wheeled locomotives.

The average cost of the two classes of engines is as follows: Average cost in cents, per mile run, for: Repairs—8-wheel, 4.16; 10-wheel, 5.78. Fuel—8-wheel, 9.53; 10-wheel, 11.23. Stores—8-wheel, .857; 10-wheel, 1.05. Average number of tons hauled to ton weight of engine, 20 tons.

From the above statement it appears that the 8-wheel engines do the same work at a much less cost.

Respectfully,

W. L. JORDAN, C. & P. R. R.
CHAS. GRAHAM, L. & B. R. R.
P. HOFECKER, L. V. R. R. } *Committee.*

Mr. CHAPMAN, Cleveland & Pittsburgh Railroad—We are evidently not going to get through with our business to-day, and, as I understand the matter, the Convention as a body have accepted an invitation to visit the Rhode Island Locomotive Works to-morrow. I would propose that we have a night session to-night, beginning at eight o'clock and continuing until we adjourn. We cannot meet to-morrow forenoon and get through. It may be necessary to have a session to-night and another one to-morrow forenoon.

Mr. HAYES, Illinois Central Railroad—Is that intended to read that we continue in session until we get through the business to-night, or do we have another session to-morrow morning?

Mr. CHAPMAN—To continue until we adjourn. A motion to adjourn will be in order at any time this evening. The motion was agreed to.

The SECRETARY offered the following resolution, which was adopted: "Whereas, our worthy associate, Mr. M. N. Forney, has voluntarily and free of charge published the proceedings, circulars and notices of the Association in the RAILROAD GAZETTE; therefore, Resolved, that the Association do hereby remit Mr. Forney's dues and assessments for 1871 and '72.

The following Committee was appointed on "Lap and Lead of Slide Valves, and to discuss the throw of Eccentrics and General Principles of Valve Motion"—Frye, Grand Trunk Railway; Lauder, Northern Railroad; and Underhill, Boston & Albany Railroad.

The SECRETARY read a communication from the Bolt and Nut Manufacturers' Association, requesting the appointment of a committee to confer with a view of securing a standard list of nuts and washers.

The PRESIDENT—Some two or three years ago there was such a committee appointed, and their report was printed in the third annual report of this Association. What action will be taken upon this?

Mr. CHAPMAN—I think it was at the meeting in Pittsburgh that that Committee was appointed. I was Chairman of the Committee. It reported at Philadelphia, and recommended the adoption of the United States standard gauge, as was recommended by the Franklin Institute of Philadelphia, and the report of the Committee was adopted and printed at that time. A great many, I know, have adopted that standard. I did for one, all new work upon that road being put up with the standard nut.

Mr. HAYES, Illinois Central Railroad—I would move as a matter of courtesy that the same Committee be appointed to confer or meet with this Committee of bolt and nut manufacturers.

Agreed to.

The report of the Committee on Safety Valves was read, and on motion of Mr. Elliott, Ohio & Mississippi Railroad, received and placed on file.

REPORT ON SAFETY VALVES.

To the American Railway Master Mechanics' Association:

GENTLEMEN: Your Committee respectfully report that they have received communications from thirty-five master mechanics. Of this number twenty give a decided preference for what is known as the Richardson valve.

One prefers the Baldwin patent valve, four prefer the Anderson patent valve, one prefers the Payne patent valve, one the Dawson, two prefer the old style, one prefers the Richardson and one the old style, and two are non-committal.

Mr. R. Blodgett, Master Mechanic of the New Jersey Southern Railroad, reports that one engine sent to his road having the Anderson valve proved to be so unreliable that he removed it at once; while Mr. L. H. Waugh, Superintendent of Machinery of the Kansas Pacific Railway, says he uses the Anderson valve, and that it gives entire satisfaction, and is not liable to get out of order.

It is the unanimous opinion that one of the safety valves should be beyond the control of the engineer. The only objection made by any of our correspondents to the Richardson valve is the noise made when blowing off.

We consider the Richardson valve in connection with one of the old style to be the best combination that has yet been made for use on locomotives, the Richardson valve to be adjusted by the Master Mechanic of the road so that it will be beyond the power of the engineer to alter it, and one old style valve to enable him to blow off his steam at a less pressure when waiting at stations, or in case of emergency.

We do not consider that there are very good grounds for saying that the Richardson valve relieves the pressure of steam too suddenly, as it does not blow off until the maximum pressure is reached and falls certainly after blowing off from three to five pounds of steam, which variation we do not con-

s'der of any consequence in a pressure of from 120 to 130 pounds.

Respectfully submitted.

J. T. ROBINETT, Atlantic, Mississippi & Ohio Railroad,
JOHN MCFARLAND, Richmond & Danville Railroad,
DANIEL W. HAINES, Northeastern Railroad,
} *Committee.*

The report of the Committee on Place of Meeting was presented.

REPORT ON NEXT PLACE OF MEETING.

MR. PRESIDENT AND GENTLEMEN: Your Committee who were appointed to select names of places for holding the next annual convention would report the following: St. Louis, Mo.; Cincinnati, Baltimore, New York City and Atlanta, Ga. They would also recommend that the vote be taken by ballot, each member writing the name of the place of his choice on a ballot, and that a majority of all the ballots be the choice. They would further recommend that, if possible, the time to hold the next convention be fixed so as not to interfere with the Car Builders' Convention.

J. W. PHILBRICK,
H. L. BROWN,
WM. WOODCOCK,
JOHN H. FLYNN,
SANFORD KEELER.

Mr. ROBINSON, Great Western Railway—Would there be any objection to proposing that the name of Chicago be added to the list?

The PRESIDENT—We can receive the report of the Committee and then add Chicago.

The report was received and the Committee discharged. A motion was made to add the name Chicago, which was carried, and afterward reconsidered and lost.

Morris Sellers, late Des Moines Valley Railroad; Johann, Missouri Pacific; and Coolidge, Fitchburg Railroad, were appointed a committee to receive ballots.

A letter directed to Mr. Hayes, as Chairman of the Committee on Correspondence, inviting the Convention to visit the warerooms of the Cosmopolitan Solid Emery Wheel Company, was read.

On motion of Mr. Chapman, the following gentlemen were appointed a Committee on Finance for the ensuing year: Hill, Erie Railway; Coolidge, Fitchburg Railroad; Thompson, Eastern Railroad; Philbrick, Leavenworth, Lawrence & Galveston Railroad.

The PRESIDENT—There are some copies of *American Locomotive Engineering* presented here for inspection, with a letter accompanying them, which the Secretary will read.

The letter was read, and the publications received, and the thanks of the Association returned therefor.

Mr. Sellers, from the committee appointed to receive ballots for place of next meeting, reported:

Whole number of votes	74
Necessary to a choice	38
New York has	17
Cincinnati has	5
Baltimore has	26
St. Louis has	14
Chicago has	4
Atlanta has	8

On motion of Mr. Hayes, Illinois Central Railroad, the vote for Baltimore was made unanimous.

Contributions.

PRACTICAL RAILROAD ENGINEERING.

I purpose furnishing, in a series of papers for this journal, such practical information as I deem most important to the railroad field engineer, in the pursuit of his profession, touching those things generally either entirely overlooked, intentionally omitted, or involved in a mesh of algebraic formulæ by the authors of books intended for "engineers' pocket companions." However unwelcome to the profession such a declaration may be, I unhesitatingly give it as the result of my observation and careful inquiry made among engineers, that a large majority of the men now plying the profession of railroad engineering are not educated men in the usually accepted sense of that term, but are men who have "worked up" from the lowest positions in a corps to such advanced stations as they may now hold. To such men, the broad field of the higher mathematics is an unexplored region, and the abstruse formulæ of "paper engineers" are as uninviting as they appear useless and unintelligible to them. What they want is direct, available information on such matters as come before them in the due course of their labors. But it is the young engineer just beginning work who turns most eagerly to books for information, and it is often the case that the first things about which he inquires have been thought by the author of the "hand-book" too simple to need explanation.

Now, there are methods for performing various engineering operations which are in common use among practical men, and by them found to give entire satisfaction, although sneered at by exacting, if not always accurate, mathematicians, as "thumb-work," "botching," &c., and these methods are not found simply explained in any of the books usually put into the hands of young engineers. Not to prolong these prefatory remarks, let us take, for example

RUNNING A STRAIGHT LINE WITH A TRANSIT.

To do this there are three methods:

1st. With the needle.

2d. By back-sights.

3d. By fore-sights.

Dismissing for the present the first method, which will be discussed under the head of preliminary surveys, let us examine the manner of setting out a straight line by back-sights with a transit instrument.

Having established the point from which you wish to run, by driving a strong wooden stake down to the level of the ground-surface, drive a small nail into the top of the stake to mark the first point in your line. By means of the attached plumb, set your transit accurately over this point. Now carefully level your instrument, and if you wish to take the magnetic bearing of your course, unclamp the needle and clamp the graduated plate at 0. Having planted a line-rod or flagstaff as far ahead as you can see in the direction in which you wish to run, direct the telescope so that its vertical spider-line coincides with the staff, record your bearing, and have a stake driven to the surface at the point where the staff stands. Now have your flagman ho a line-rod vertically, with its pointed end resting on the top of the stake, and motion him left or right till your spider-line again coincides with the rod. Now have a small nail driven in the exact spot where the point of the rod rested, and you are ready to go forward with your instrument and set it over this second point; which being accurately done and the plates leveled, direct the telescope on a line-rod held vertically on the first point, then carefully reverse the telescope by revolving it on its horizontal axis. If your instrument is in accurate adjustment, you now have the telescope directed exactly on your line, to continue which you have only to repeat what has been described. It is always best, even if you consider your transit accurately adjusted, to change at each setting the direction of the plates. This will obviate slight deviations.

TO RUN BY FORESIGHTS ONLY.

This is done by beginning as described in the case of back-sight running; but you must establish *two* forward points in your line before moving your instrument. This being done you have only to go forward and set your instrument over the nearer point and direct the telescope on a line-rod held on the farther one, which gives you the proper direction in which to continue your line.

This method is accurate, but cannot well be used in a rough country. It is preferable to any other for setting track-centers and keeping earthwork in line during construction.

The secret of setting out correctly a straight line of any length with the common railroad transit may be disclosed by a few simple rules.

1. Keep your instrument properly adjusted, and to do this examine it frequently.

2. Set it carefully over your points and level it with great exactness.

3. Train your flagman to hold the line-rod vertically.

4. If your instrument is not in precise adjustment you must, in running by back-sight, take two observations on each forward point, reversing the plate for the second observation, and a mean between the two points thus established is where the stake should be driven.

5. Run by fore-sights if possible.

With such instructions as the above, any young man of ordinary intelligence who has learned to adjust a transit can, by using proper forethought and care, set out a straight line which will compare favorably with the tangents of our most carefully constructed railroads. But such instructions can be obtained from any practical engineer and nowhere else. I propose in the series of papers to which this is simply prefatory to describe the methods of surveying and constructing a railroad, as practiced by the *out-door* field engineers of the West; and if the rules I lay down and the instructions I may venture happen to contrast sharply with the high-pressure, ultra-algebraic demonstrations of certain hand-books, it may cause thought and examination, if nothing more. The following are the titles of the proposed papers in their order:

1. Preliminary Surveys—Right of Way—Grubbing and Clearing.
2. Location of Tangents and Curves.
3. Railroad Leveling.
4. Leveling for Cross-sections and Side-staking.
5. Practical Methods of Estimating Earth-work.
6. Timber for Trestles, Cattle-guards, Cross-ties and Farm and Road Crossings.
7. Setting out Frog-angles and Locating Side-tracks.
8. Bending Rails for Curves, and Finding Ordinates for Curved Trestles.
9. Advice to Young Engineers.

NO. I.

PRELIMINARY SURVEYS.

A preliminary survey is sometimes called a *random* survey; but the first thing an engineer ought to learn is to avoid doing anything at random. Work of any kind done without due forethought and careful preparation is generally valueless, and this is specially true of engineering operations.

Since it is of railroad surveys we are now to inquire, let us learn the practical method of running what is called a *preliminary line* between two points we wish to connect by a railroad.

Your first step is to procure all the information you can touching the country through which your proposed line must pass. If practicable you should examine all the considerable streams to be crossed, and make a rough estimate of the cost of crossing at two or three of the most available places on each. If any maps of the localities to be traversed are in existence you should procure them or copy them. Maps showing the government rectangular survey are peculiarly valuable at the outset of your labors. In order to familiarize yourself with the features of the country, learn the names of the farmers and talk freely with them. An engineer must train his memory to retain the local names of places, like Smith's Ferry, Jones' Schoolhouse, Pisgah Church, etc., etc., as persons of whom he asks information will be continually referring to them. If, as is quite often the case, there has been a preliminary survey made by other parties over the same ground, you should, if possible, procure their maps, profiles and estimates. Having possessed yourself of all the information time and other circumstances will allow, you may now proceed to organize your engineer corps. We will suppose, in order to more perfectly explain the operations in detail, that you intend to stake out the line first, and then go over it with the level. Your corps at present, then, will consist of what is generally termed a "transit party," that is, yourself as transit man, a flagman, two chainmen and three axmen. See that your chain is just one hundred feet long, and that the axes of your men are in good condition. A broken axhandle may stop the operations of a corps for a whole day.

When everything is ready, set your ax-men to making stakes, which should each be two feet long, nicely smoothed for about four inches at one end, where it must be at least two inches wide, and sharpened at the other. While this is going on, place your transit firmly over the commencement point, which must be marked by a strong stake driven firmly into the ground and almost to the surface; level your instrument carefully, unclamp the needle, and set off on the graduated limb the degrees and minutes of the course you wish to run, and clamp the vernier securely. Now, as soon as your needle has settled, you have only to turn the entire top of the instrument around its vertical axis till the needle indicates 0 on the graduated compass-plate, which will place your telescope in the desired direction, and your flagman may be sent forward and his staff lined in as far ahead as you can see him. This done, you order your men to chain out in the direction of the flag, the ax-men putting in a stake at each hundred feet, numbering them on the face near the top, 0, 1, 2, 3, etc. (These numbers you must keep recorded in your field-book on the left-hand pages, while on the right-hand pages you note the dividing lines of farms, stream-crossings, the number of the stake nearest to where you enter and where you leave timbered land, the kind of soil and the probable sub-soil over which you pass, the outcropping of stone or any mineral deposits, etc. etc.) To continue your line, you have only to move your instrument to the second point and repeat what has just been done Whenever it is necessary to change your course, you have only to set out the new bearing on the plate, turn the instrument on its vertical axis till the needle indicates 0, record your new bearing, and fix a point by lining the flagman in on the new course.

It is often necessary to run several lines between two points before the cheapest and best route can be ascertained; and if the face of the country to be passed over is about uniform in its physical features, the first line should be straight, so that it may serve as a base of reference in calculating the bearing of subsequent lines, and so that the difference in the lengths of the straight and deflected lines may be noted and taken into account in estimating the cost of construction.

The principal things to be carefully considered in choosing between any number of routes over which preliminary lines have been run, may be summed up as follows:

1st. The respective lengths of the lines.

2d. The difference in the gradients.

3d. The difference in the amount of timber and earthwork of the lines when completed.

4th. Difference in the cost of bridges and masonry.

5th. Right of way; comparative amounts of grubbing and clearing.

6th. The facilities for securing timber and stone, gravel and water for each line.

Of course, all other things being equal, the shortest line between two points is the cheapest and in every way the best but, as it is generally impracticable to make a railroad straight throughout its length, it often becomes a question of careful consideration as to how far we may deflect from a straight line to avoid heavy work and objectionable grades. To decide this question the engineer must, in making his preliminary surveys, tax his mind constantly, getting together all the information directly or remotely bearing on the subject. Of course, so far as the grades and the amount of earthwork are concerned, he must depend on his level for information, as will be properly explained under the heads of "Railroad Leveling" and "Estimating Earthwork." The manner of estimating bridge and trestle work will also be discussed at the proper place. But during the time he is running his preliminary lines, the engineer cannot better serve the interests of his company than by making careful inquiry concerning the willingness of persons to *give* the right of way across their premises, or, if they will not donate the right of way, let him ascertain the market value of the lands per acre, what the price of timber is in the different localities, what the prospects are for laying out and building up small towns at certain points, and let him also inquire diligently for gravel deposits, and if any are found examine them as to their availability for ballast. At the stream-crossings examine closely to ascertain the nature of the foundation upon which your trestle-bents and bridge piers must rest. It is well, before starting on a preliminary survey, to obtain a supply of blank releases of right of way, so that whenever you find a man ready to grant the right of way you may at once fasten him. I consider this very important, and the young engineer should carefully note it.

But I will not give advice without a reason, and the explanation here is very easy, involving only an interesting and deep-seated principle of human nature. It is this:

When a railroad is in the embryo state—that is, about the time the first surveys are being made—is the time when it has the most interested friends among the people along its line. Just then you will find right of way quite obtainable by a little effort. But if you dally and wait till the laborers are thrown upon your permanently located road, and the farmers become vexed because the "hands" leave down their fences and steal their apples, and the housewives are fretting because some of these same "hands" have left without paying their board-bills, and then you ask for right of way, the chances are about ten to one that you are contemptuously dismissed In closing this paper let me condense in a nut-shell what my experience has taught me touching right of way. It is simply this: You should never run a line across any man's land and leave without skillfully ascertaining that man's feelings about releasing or deeding the right of way to your company. And wherever it is likely a station will be located, you must look out for ground for the depot-building and side-tracks.

HOOSIER.

Hanover Junction & Susquehanna.

The President and directors of this road met Governor Cook and the Board of Public Improvements of the District of Columbia, with the President and directors of the Frederick & Pennsylvania Line and of the Hanover Junction road, at Hanover Junction, July 9. The visitors had been viewing the line, now partly surveyed, between Washington and Hanover, *via* Frederick.

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CONTENTS.

ILLUSTRATIONS:	Page.	EDITORIALS:	Page.
Direct-acting Steam Riveting Machine.. ...[Plate]	339	"To Bridge Builders".....	337
CONTRIBUTIONS:		Excursion to the Coal Fields of Pennsylvania.....	337
Practical Railroad Engineering.....	335	Among the Shops.....	338
The Northern Pacific Railroad.....	338	The Weight of Cars	338
Eastern Engineering from a Western Point of View	339	Record of Track Increase..	338
EDITORIALS:		EDITORIAL PARAGRAPHS. ...	338
Congress and the Northern Pacific	336	GENERAL RAILROAD NEWS:	
Locomotives for Freight Service.....	336	Report of the Master Mechanics' Association.....	331
Railroad Earnings.....	337	Chicago Railroad News....	340
		Elections and Appointments	340
		Traffic and Earnings.....	340
		Personal	340
		Old and New Roads.....	340

Editorial Announcements.

Correspondence.—*We cordially invite the co-operation of the railroad public in affording us the material for a thorough and worthy railroad paper. Railroad news, annual reports, notices of appointments, resignations, etc., and information concerning improvements will be gratefully received. We make it our business to inform the public concerning the progress of new lines, and are always glad to receive news of them.*

Articles.—*We desire articles relating to railroads, and, if acceptable, will pay liberally for them. Articles concerning railroad management, engineering, rolling stock and machinery, by men practically acquainted with these subjects, are especially desired.*

Inventions.—*No charge is made for publishing descriptions of what we consider important and interesting improvements in railroad machinery, rolling stock, etc.; but when engravings are necessary the inventor must supply them.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

CONGRESS AND THE NORTHERN PACIFIC.

In another column a correspondent has something to say of the remarkable report made by one of the members of the House Pacific Railroad Committee, at the very close of the session, respecting the Northern Pacific Railroad Company—a report which we mentioned recently as a somewhat strange document made in strange circumstances, the majority of the Committee being absent, and the complainants at whose instance the investigation was ordered not having been heard, but testimony having been received from the President of the railroad company, and from him alone. If there really was no ground for complaint, and the investigation had been ordered purely to embarrass the company (which would not be impossible), that is the fact which the Committee should have set forth; but an attorney of the complainants' has declared to the contrary, saying that the Committee had agreed, when a majority was present, to postpone the investigation at that session, and to take testimony and present a report at the next session.

An examination of the report and the evidence submitted to the Committee (which were ordered printed and *recommitted* to the Committee on the Pacific Railroad) shows that the facts presented by our correspondent are accurately made, whatever may be his inferences. We believe that the charges made by the bondholders, or which Mr. Banks said were preferred by some of them, and on which the investigation was ordered, were, in effect, that the money received by the company had been in large part expended for the purchase of the St. Paul & Pacific Railroad, which is no part of the security for the payment of the bonds.

Now we believe there is nothing in the charter of the Northern Pacific, or in the terms of the mortgage, to prevent its expending the proceeds of its bonds for other railroads, or for anything it chooses. It is authorized to issue a loan of something more than a hundred millions, which is secured by a lien on the company's land grant, its franchise, and by such part of the road as is completed. If it can construct the road for $50,000,000, it may buy railroads, build harbors and warehouses, or parks and palaces, with the other fifty millions, without let or hindrance; only, investors in new enterprises usually expect that their money will be secured by all that it buys and something more, and they sometimes—very unreasonably, perhaps—hesitate a little in accepting as security for the two thousand dollars they lend the structure which costs only one thousand dollars. It may be said there is the land grant; but this is bought by the bondholders' money just as truly as is the railroad; for the grant is given for the railroad, and was asked because it was supposed that capitalists would not consider a railroad sufficient security for the money it cost.

Our correspondent takes exception to the apparent lack of any proceeds from the capital stock.

In this we fear he is disrespectful to one of our great American industries. If no money, or but a trifle, has been paid in on Northern Pacific stock, we fear that this fact would not by any means make it singular among the newer railroad companies. It is not uncommonly thought that the wear and tear of brain caused by inaugurating a new corporation and determining its route is worth pretty nearly as much as the stock, and not seldom a profit of a few thousands of dollars a mile in the construction. The company which has 10 per cent. of its capital stock actually paid in cash by individuals holds its head very high. And, really, in this case the amount is so trifling as not be worth taking into account. The whole amount, if paid in, would be less than half a million, and with a loan of a hundred millions authorized, what is this? It is not a tenth of the commission which many companies pay for negotiating their bonds. Besides, how do we know that this trifle of 10 per cent., this $424,160, is not included in the "assets and bills receivable?" Perhaps the shareholders gave their notes for the shares, or perhaps the leading shareholders gave their notes for the 10 per cent. and presented the shares as seemed to them to the interest of the company. Who shall say I shall not reckon notes among my assets? especially if they are the notes of one I can trust—myself, for instance.

Again this querulous correspondent apparently is not pleased because the financial agents of the company also own a majority of its shares. But let him consider the beautiful simplicity of the thing. Jay Cooke & Co. want to borrow money on certain property (the world not knowing that they own it). Then Jay Cooke & Co., financial agents, announce that they have made a careful examination of the property and recommend it unqualifiedly as an excellent security. Why not? Who can know it better? And to secure those who lend, the property which Jay Cooke & Co. control is mortgaged to Jay Cooke and another as trustees. Moreover, there is usually a large commission paid to bankers for negotiating railroad bonds; and in this case we may suppose that Jay Cooke & Co., bankers, do this work for Jay Cooke & Co., stockholders, at a very reasonable rate. Thus a saving of a large amount may be effected.

At the time the report was made, the company owned 254 miles of road, and $13,945,200 of bonds had been sold, which is something more than $50,000 per mile of road; but we believe there is nothing in the charter or mortgage forbidding the issue of bonds on the road before its completion, and capitalists may take up the entire issue of a hundred odd millions now—if they wish to. The company, however, owned a half interest in 23 miles of road and had a considerable amount of work done for road not completed. But there is an issue of sterling bonds to the amount of $20,000,000, which is reported to have been sold in London. This would make a total of nearly $34,000,000. The cost per mile of the Eastern Division is given as $23,571, and of the Western Division $28,560 per mile. Taking the latter amount, and the $3,000 expended for rolling stock (which includes a locomotive equipment of one engine to about five miles of road, which is nearly as great in proportion as that of the Chicago & Alton, and considerably greater than that of the Chicago & Northwestern, with all their established traffic), and assuming this to be the cost hereafter, the bonds already issued should pay for about 600 miles more of road.

With reference to the St. Paul & Pacific Railroad, the testimony of President Smith is not altogether definite. He says that the majority of the stock "is owned and controlled *in the interest of* the Northern Pacific," but that the organization is entirely distinct, and that it is not determined that the St. Paul & Pacific is to be a part of the Northern Pacific system. He says he is not able to state the condition of the former company; not having access to its books. Advertisements of the Northern Pacific, however, make the statement that it "last year purchased both the main line and branch of the St. Paul and Pacific Railroad." If this is true, it must have purchased them with the Northern Pacific's money, and this money, as the evidence before the Committee of Congress shows, is almost entirely the proceeds of its bonds.

It is of course possible for a company to have a property worth so much more than it costs that it is good security for twice as much as the price paid for it, or more; but it is not often that the average capitalist is willing to lend on such security, nevertheless.

LOCOMOTIVES FOR FREIGHT TRAFFIC.

At the Master Mechanics' Convention held in Louisville in September, 1871, two committees were appointed to prepare reports, the one on the "Comparative performance and cost of operation of ten-wheeled engines with six drivers coupled, and eight-wheeled engines with four drivers coupled;" the other on the "Comparative performance and cost of operation of eight and ten-wheeled engines for freight service."

That these two subjects should have been combined in one is very obvious, and that there is considerable ambiguity in their statement is also plain, when we observe that in the latter case it is impossible to tell whether by eight-wheel engines mogul or ordinary American locomotives are meant. The reports of the committees, too, bear evidence that those who prepared them were not clear as what was to be the subject matter of their reports. In the first, the authors are, however, very explicit, and state that they were appointed to report upon the relative merits of "the six-driver engine with two-wheel truck, the six-driver engine with four-wheel truck, the four-driver engine with four-wheel truck." In this we think they have misapprehended what was intended when they were appointed, but that is of little importance.

The other Committee have compared ten-wheel engines which have six drivers with American or eight-wheeled engines having four drivers, so that there are two reports, in both of which there is a comparison of the merits of these two classes of locomotives. The one report draws the conclusion that mogul engines can be operated for 33 per cent. less than American engines with four drivers. The second report gives the average expense per mile run of operating American and ten-wheeled engines, with four and six driving-wheels, respectively, at 14.51 and 18.06 cents, or nearly 25 per cent. more for the latter than the former. The Committee also say that the average load hauled was 20 tons per ton weight of engine. If now the weight of the ten-wheeled engines is 25 per cent. greater than that of the others, then, according to the Committee, they would haul 25 per cent. more load, and therefore, even if their operating expenses were greater *per mile run*, they would not be any more *per ton hauled per mile*, and consequently the engines would be alike so far as their *economy* of operation is concerned. As the Committee do not give the weight of either class of engine, it is of course impossible to draw any deductions which will have any value. The mere fact that the expenses per mile run are less with the one class of engine than with the other proves nothing without other facts to explain it.

That both of these reports are based upon data insufficient to justify any conclusions regarding the relative economy of the different classes of engines is very obvious to any one who examines them with any care. In the first report, no account is taken of the fuel consumed, and in neither of them are the average loads which are given, and which it is said were hauled, more than shrewd guesses at the fact. The last report, in fact, consists of nothing more than a summing up and making an average of the cost given for the two classes of engines on different roads, the conditions of which are so diverse as to have no value at all in evidence in the present instance. As an example, statistics are given from the Chicago, Burlington & Quincy Railroad. On that line the only ten-wheel engines in use are old, nearly worn out, and badly designed, and are used either quite or almost entirely in switching service. The greater proportion of its eight wheeled engines are comparatively new, and of the latest design. That a comparison made upon such a basis must be entirely misleading, is very obvious.

The reasons given for the preference for the mogul over the American engines for freight service are also curiously inexact. The first is, because "The mogul engine is carrying 75 per cent. less dead weight on truck than any other class of engine that uses a truck." By dead weight must be meant the weight of the locomotive itself, because none other is carried on the truck. Now there are engines which use a truck and yet carry *none* of the weight of the engine on it, but place the water and fuel on the truck. That "the weight is better distributed than it can be with any other build of engine," is also very doubtful. If by "distributed" is meant extended over a larger wheel-base, it is obviously not true; if, however, it is meant that the weight is divided more equally on the wheels, it is doubtful. That "they are much lighter on the rail than other classes of engines of the same weight," if interpreted literally would be no better than an Irish bull. If it means that they do not wear the track so much in passing around curves, then it would not be difficult to find rebutting testimony of a very strong kind. That "they will haul 33 per cent. more cars than a four driver engine—the cylinders, drivers and gross weight being the same," we know will be denied in the most distinct way

by those who have had long experience in the use of such engines. That they have less weight on each pair of wheels than an American engine with four drivers may be true, but it would be easy to design an engine equal in power to a mogul engine of which it would not be true.

We make these criticisms of the reports, not because we desire to advocate any of the plans of engines which have been discussed, but because we believe it is important that the merits and disadvantages of each should be accurately known and distinctly stated.

It is true that while the arguments which the committees have used may be entirely illogical, their conclusions may nevertheless be quite sound, as truth is very often defended by false reasoning. At the present time some accurate information is very much needed regarding the relative merits and cost of operation of mogul, ten-wheeled and American engines, and for this reason we have called attention to what the committees have *not* given in their reports, in the hope that in future such information may be collected in a form which will be useful and valuable, and will shed some light by which it can be determined what form of engine is best adapted for freight service, especially on heavy grades and curves of short radius.

While some roads on which none but eight-wheeled engines with four drivers have been used are now ordering mogul engines for their heavy traffic, others on which this class of engine has been extensively employed are now discarding them, and coming back to the original form. In Europe every conceivable plan has been adopted, and the double-truck system is being tried under a great variety of circumstances. Here, so strong is the confidence in the value of the truck that no engines are at present being built for anything excepting switching service without some form of truck to give flexibility to the wheel-base.

The whole subject offers a very inviting and fertile field for investigation to some committee or member of the Master Mechanics' Association, and we hope that some one will undertake the task, although no committee is appointed to report upon the subject at the next annual meeting.

Railroad Earnings.

We have delayed our usual monthly tabular statement of the earnings of such railroads as report, in order to obtain the official returns for some of the roads, which give "estimates" only in reports printed earlier. The month of June completes the first half-year of 1872, and an accurate statement of the earnings of the roads is therefore particularly interesting. The following is, we believe, the only report that has appeared giving accurately the returns, and including no estimates.

EARNINGS IN JUNE.

	1872.	1871.	Increase.	Decrease.	P.ct.
Atlantic & G. West.	$435,501	$369,010	$66,491	....	18
Central Pacific.....	1,222,140	795,176	426,964	....	53⅔
Chicago & Alton....	435,192	466,097	....	$30,905	6⅔
Erie.....	1,464,963	1,498,493	....	34,530	2⅓
Illinois Central.....	641,410	718,722	....	77,312	10¾
Kansas Pacific.....	315,363	266,086	49,277	....	18½
Lake S. & Mich. So..	1,311,110	1,140,916	170,194	....	15
Marietta & Cincin..	154,587	115,115	39,472	....	34
Michigan Central ..	505,314	427,096	78,218	....	18⅓
Mil. & St. Paul.....	594,769	658,017	....	63,248	9⅔
Mo., Kan. & Texas..	143,113	70,735	72,378	....	102⅓
Ohio & Miss.....	249,911	197,108	52,803	....	26¾
S. L., Al. & T. H...	130,079	139,769	....	9,690	7
St. Louis & I. Mo'n.	184,786	1.4,786	66,000	....	57⅙
St. L., Kan. C. & N'n	296 820	211,581	85,239	....	40¼
Tol., Peoria & War..	94,5 2	86 860	7,662	....	8⅘
Tol., Wabash & W..	4 2,868	439,515	23,353	....	5⅓
Pacific of Missouri .	286,738	262,278	24,460	....	9⅓
Total.....	$8,924,186	$7,977,369	$1,162 511	$215,685	
Net increase			946,826		

EARNINGS FROM JANUARY 1 TO JUNE 30.

	1872.	1871.	Increase.	Decrease.	Pr.ct.
Atlantic & G. West	$2,312,228	$2,168.150	$144.078	....	6⅔
Central Pacific.....	5,534,334	4,044,882	1,489,452	....	36⅘
Chicago & Alton...	2,302.151	2 396,954	....	94,803	4
Erie	8,786.578	7.423.983	1,362,595	....	18½
Illinois Central....	3,597 480	3,770.071	....	172,591	4⅝
Kansas Pacific.....	1,652,775	1.430,293	222,482	....	15⅓
Lake S.& Mich. So..	8,485.425	7,019.612	1,465,813	....	20⅞
Marietta & Cin.....	904,931	750,785	154,146	....	20½
Mil. & St. Paul.....	2,924,163	2 928.609	....	4,446	⅛
Michigan Central...	3,189,452	2,727,054	462.396	....	17
Mo. Kan. & Texas.	677,837	388.340	289.497	....	74⅔
Pacific of Missouri.	1,667,444	1,620.539	46,905	....	2⅞
St. Louis & I'n M.	1,059,132	755,270	303.862	....	40¼
St. L., Kan. C. & N.	1,646.071	1,276,370	369 721	....	29
St. L., Al. & T. H...	896,898	837,428	59,470	....	7
Tol., Peoria & War..	628,7.0	481.956	143.741	....	29⅘
Tol.,Wabash & W.	2,753.348	2.423,554	329,794	....	13⅔
Total....	$49,018,947	$42,446,832	$6,843,955	$271,840	
Net increase.....			$6,572,115		

As we have noticed before, these reports of eighteen roads for June and seventeen for the half-year include none from a Southern railroad. Neither do they include any from New England. Only the Erie of the great trunk lines from New York westward reports earnings. These latter probably would be the best index to the general condition of traffic in the country, in the absence of general returns. Two of the great lines from Chicago eastward report, and their returns indicate pretty fairly the condition of Chicago traffic. Two roads entering Chicago from the West report, both showing for the month and for the half year a small decrease. All the roads entering St. Louis from the West, three in number, show an increase, which is very large on two of them without any notable increase in mileage, and small on the third with a large increase in mileage. Those from St. Louis eastward (three of the four which do most of the through traffic report) all show an increase, small on two and large on one; but not so large in the aggregate as that of the roads from Chicago eastward. There has been an increase of mileage on several roads, but in the aggregate it is much less than the increase in earnings, which for the half year is at the rate of 15½ per cent., and for the month of June nearly 12 per cent., the rate for the month being the lowest yet reported.

We cannot depend on these reports as at all conclusive as to the general condition of railroad business in the country. By far the largest number of roads and many of the most important ones make no report; and the mileage of those which do report is probably less than one-sixth of the total mileage of the country.

Of the roads whose reports are given above, the Central Pacific, Chicago & Alton, Michigan Central, Missouri, Kansas & Texas and Pacific of Missouri, have a large increase of mileage this year; the Lake Shore & Michigan Southern, and the St. Louis & Iron Mountain have a small increase in mileage; the Toledo, Wabash & Western has a large increase of mileage, but reports earnings, we are informed, only from the old mileage for both years; and the others have either no or very little increase of mileage.

"To Bridge Builders."

Those of our readers who are interested in bridges and bridge contracts will remember an advertisement which appeared in the GAZETTE in June, in which the commissioners empowered to build an iron or a suspension bridge across the Chemung River at Elmira, N. Y., invited builders to give them information concerning the cost, etc. The bridge, if not built on the suspension principle, was to be in five spans of 160 feet each, with a carriage roadway 20 feet wide, and two sidewalks each six feet wide; to be calculated for a load of one ton per lineal foot, the tensile strain in the wrought iron not to exceed 12,000 lbs. per square inch. The amount of masonry, it was estimated, would be from 1,000 to 1,800 square yards.

The following were the tenders which were submitted:

1. National Iron Bridge Company, Massillon, Ohio: $42 per lineal foot, using three arches to a span, or $40 per foot with two arches to a span. This design belonged to that inscrutable class in which little regard is paid to the laws of statics.

2. Phillipsburg Manufacturing Company, Phillipsburg, N. J.: $74,680 for the entire work, or $52,000 for the superstructure alone. The bridge to be made of wrought iron entire. We are informed that this bid was made under the misapprehension that there were but four spans of the bridge, and that $13,000 was added for the fifth span. The same company offered to build a suspension bridge for $55,336, including masonry, or the superstructure alone for $31,340.

3. T. B. White & Son, of Pittsburgh, offered to build the superstructure of a truss bridge for $54,000, or the entire work for $79,500.

4. The Continental Bridge Company, of Philadelphia, proposed to build the superstructure, with wooden floor beams, for $63,300; or for $74,500 with iron floor beams.

5. The Baltimore Bridge Company's estimate was $55,700 for the superstructure with iron floor beams, or $50,700 with wooden beams.

6. Kellogg & Maurice, of New York, bid $61 per lineal foot for the superstructure, of wrought iron entire.

7. A party by the name of Shipman, whose full name and address we could not learn, named $75 per lineal foot for a full wrought-iron bridge, or $65 if cast iron was used for the compression members.

8. The Messrs. King, of Ohio, calculated that they could build a *good* iron bridge for $39,077.50 for the superstructure, or a *better* bridge for $51,950.

9. Charles Macdonald's (of New York) price was $82,172 for the entire work, the bridge to be all wrought iron. The masonry alone he estimated at $14,282; or he would build a suspension bridge for $77,705, including the masonry; or the superstructure alone with iron floor beams for $58,305, or with wooden floor beams for $48,500.

10. The Michigan Bridge & Construction Company, of Detroit, calculated they could do the work for the superstructure with iron floor beams for $56,500, or $52,500 with wooden floor beams, and the masonry for $23,000.

11. The Keystone Bridge Company, of Pittsburgh, counted that the cost of the bridge, all wrought iron, would be $77.77 per lineal foot.

12. The Watson Manufacturing Company, of Paterson, N. J., was willing to take the contract for the superstructure for $56,250, and the masonry for $23,750.

13. Howard Soule's estimate for a Whipple truss, entirely wrought-iron was $58 per lineal foot; or for a Whipple wrought-iron arch bridge, $56 per lineal foot; or for a Whipple cast-iron arch bridge, $46 per lineal foot. The masonry he would do for $34,000.

It will be seen that the highest bid for the superstructure built entirely of wrought-iron was $74,500; and the lowest, $32,000; but as some of the engineers who were present expressed considerable doubt whether the bridge proposed for the latter price would sustain its own weight, it might be well to throw that out. The next lowest bid was for what the contractor assured the Commissioners would be a *good* bridge, which he would build for $39,077.50; or he would build a *better* one for $51,950.

But even among the builders who are recognized as being thoroughly competent engineers, there was an almost unaccountable variation in price. Thus, one firm bid $18,800, while another bid $74,500, or over 50 per cent. more for the same work. Either the one party expected to realize a very exorbitant profit, or the other would lose by doing the work; or else the plan proposed by the one firm was much more economical than the other. Notwithstanding all that has been written and calculated regarding bridge construction, there still seems to be much ambiguity about estimates and the cost of work.

Doubtless much of this ambiguity is the result of the very indefinite specifications on which the contractors are often obliged to base their estimates. County Commissioners especially are often not the most intelligent nor incorruptible class of people, although, in the case of the Elmira Commissioners, all who were present were unanimous in approving the perfectly fair way in which the tenders were received and considered. In nearly all such cases, however, the Commissioners are entirely ignorant of the laws of bridge-building, and consequently are at the mercy of every mechanical charlatan who may feel disposed to delude them. The specifications are nearly always so loosely and ignorantly prepared that they form no restriction on those who are dishonest and no guide to those who are ignorant; and therefore the really competent and conscientious engineers are often driven out in such competitions and the work is done by those who are utterly incompetent.

In the case of the Elmira bridge no award was made, as the Commissioners were obliged to refer their recommendations to the Board of Aldermen, or Common Council, or whatever the name may be of the Elmira city fathers.

Excursion to the Coal Fields of Pennsylvania.

Those who have never visited the anthracite coal regions of Pennsylvania have very little idea of the extent of the business of coal production and transportation, and of the amount of money invested in it. It was this fact which induced the Central Railroad Company of New Jersey and the Wilkesbarre Coal and Iron Company to organize an excursion, the object of which, as stated in the invitation, was "to give the managers of New England railroads and others interested an opportunity to examine the works of this company, together with those of the Lehigh Coal & Navigation Company and the Wilkesbarre Coal and Iron Company, and their capacity for producing and transporting anthracite coal to tide-water."

The excursion left New York at 9 o'clock on the morning of July 16, and visited Port Johnston and Elizabethport to inspect the piers and coal-pockets for transhipping coal from the cars to vessels. We will not undertake at the present to give any description or statistics of the business or "plant," as we propose to give our readers soon some carefully prepared descriptive articles of the road's business and the machinery employed in the anthracite coal business. At Elizabethport the shops of the railroad company were visited, and the engines and cars examined. The shops are regarded as only temporary, and the buildings are inferior to the general equipment of this very excellently managed road. The machinery and tools, however, are of the very best and most improved description.

Three cars were provided for the party, one an open car, with simply a roof to keep off sun and rain. This afforded a good view of the picturesque country through which the Central Railroad is located. The growth of the towns and villages whose population do business in, and, in fact, to all intents and purposes are citizens of, New York, is very striking. Quite sufficient to justify the prophecy made in the pages of the GAZETTE that railroads will ultimately, and probably quite soon, change entirely the character of metropolitan life, and distribute the people of all large towns and cities over larger areas of country.

At Bethlehem the party visited the iron works and new steel works, which, when completed, will be the largest in the country. The machinery is now being erected, and it is expected that the works will be put into operation some time within a year. At Allentown and all along the Lehigh River the excursion party had an opportunity of seeing the iron works of that region, which each year grow in number and extent. A delightful lunch was served in true pic-nic style in a grove at Walnut Port, and Mauch Chunk was reached at 4:25 p. m. From that place the whole party ascended the mountain to the celebrated Switch-back, and thence were taken up to the summit on the inclined plane. From the top the cars descend by gravity alone. The night was spent at the Mansion House, and at 7:45 next morning Panther Creek Valley was visited, to which the celebrated Nesquehoning Tunnel affords the means of access. They also visited the collieries at Summit, Honey Brook and Tamanend, returned to Mauch Chunk for dinner, and started for Upper Lehigh and Wilkesbarre at 2:30 p. m., arriving at the latter place at 6:45 p. m.

On Thursday, the 18th, the excursionists were taken in carriages from Wilkesbarre to Plymouth and Sugar Notch, thence by train to Newport and Ashley. At each of these places opportunities were offered to examine the machinery and operation of coal breakers, and at one of them a number of the party descended a coal mine to see the process of working underground.

From Ashley they were taken to Scranton for dinner, and after dinner they were driven around Scranton and suburbs in carriages and returned to Wilkesbarre at 5:50 p. m.

On Friday the route was over the top of the mountain by the inclined planes, which are operated by stationary engines and endless wire ropes, and thence by train to Mauch Chunk to dinner, and thence by special train back to New York.

Among the party were the Hon. A. D. Briggs and Hon. C. F. Adams, Jr., Railroad Commissioners of Massachusetts; Gen. George Stark, of Boston; Mr. George E. Towne, of Fitchburg; Mr. William P. Burrill, Mr. W. H. Jourdan, Mr. C. P. Horton, of Boston; John Taylor Johnston, of New York, President of the Central Railroad Company of New Jersey; R. C. Ricker, Superintendent; Samuel Knox, Treasurer; Mr. John P. Ills-

ley; Mr. Charles Parrish, President of the Wilkesbarre Coal and Iron Company; Mr. Samuel Bonnell; Mr. John Y. Smith, of Pittsburgh; Mr. H. P. Baldwin, General Ticket Agent of the Central of New Jersey; Mr. P. H. Wyckoff, Mr. T. W. Peeples, Mr. W. W. Stearnes, Mr. P. A. Street, Mr. George A. Debow and Mr. Joseph F. Tuttle.

The train in which the excursion was made was equipped with Smith's vacuum brake, which worked very well, considering the somewhat imperfect way in which it was fitted up, and the still somewhat crude condition of the invention.

The extent of the business of coal production was a cause of surprise to all of the party who were unfamiliar with this section of the country and its resources. It is impossible for any one to realize its extent without personal observation. It is, we believe, the present intention of this company to develop as fully as possible the capacity of its road and the section of the country which it reaches, and to secure if possible better facilities for the transportation of coal from New York to New England and other ports. As stated before, we propose soon to give our readers some carefully prepared descriptions of the anthracite coal traffic, and therefore delay the facts and figures concerning it until that time.

Among the Shops.

THE HARLAN & HOLLINGSWORTH COMPANY'S CAR WORKS.

This establishment is one of the oldest, if not *the* oldest, railroad car manufacturies in the country. It was organized and commenced operations at Wilmington, Delaware, in 1833, under the firm of Betts, Harlan & Hollingsworth. Mr. Hollingsworth, the President of the company, is the only survivor of the original firm, and is still actively engaged in the management of the business. In 1845 they commenced building iron ships, which has ever since formed an important branch of their business.

The car shops of the Jackson & Sharp Company, and Bowers, Dure & Co.—both in Wilmington—are offshoots from the older establishment of the Harlan & Hollingsworth Company. Both Mr. Jackson of the one company and Mr. Bowers of the other were formerly foremen in the Harlan & Hollingsworth shops.

The location of Wilmington gives extraordinary facilities for the business of car manufacturing. Occupying a central position between the North and the South, with facilities for shipping either to the East or the West, and accessible to the lumber regions of Pennsylvania and the far South, and within easy reach of both anthracite and bituminous coal and iron, its manufacturers are able to compete with any other section, both in the cost and quality of the cars built. Of these advantages the car manufacturers of Wilmington have not been slow to avail themselves, as is indicated by the extent of their business.

At the present time about a thousand men are employed in the two departments of the Harlan & Hollingsworth Works, somewhat less than half of them in the car department and the rest in ship-building. The proprietors now contemplate enlarging the car department by the erection of a new shop 135x200 for finishing and painting cars. The new building is to be of two stories, the upper part to be devoted to upholstering, varnishing and cabinet work. This will increase the capacity of their establishment very materially.

The present shops are the production of a slow growth and have been extended as the demands of an increasing business required. Their arrangement is consequently somewhat irregular. The erecting shop is 181x41½ feet; the planing mill, 104x22x63 feet; timber shop, 101x66½ feet; the finishing shop, 115x70 feet; and the blacksmith shop, 140x44 feet.

The work done is sent all over the country. The orders which are at present being executed are from the Eastern, the Providence & Nashua, Southern Central of New York, New York, Boston & Albany, Wilmington & Western, Great Western of Canada, and Lehigh Valley roads, besides numerous orders from the Pullman Palace Car Company. The finish of some of the Pullman drawing-room cars is the most perfect we have ever seen. They have six-wheeled trucks, and are finished inside with walnut, Hungarian ash, birds-eye maple, amboine and inlaid with wood of different colors and in beautiful patterns, so that the comfort of these cars is quite equal to that of a luxuriously-furnished drawing-room. They all have the Baker hot-water heater and Creamer ventilators.

We saw no very marked novelty in the design or construction of their cars, but the work is all done in the most thorough manner and in excellent taste. Nearly everything connected with the cars which they build is done in their works, even to the designs for their head linings. In this connection, it might not be amiss to call the attention of car manufacturers and railroad men to the style of head linings which have become standard on American railroads, and to suggest that they might be varied to advantage if some new ideas were introduced into their design. The Pullman Company have done most to introduce the present styles, which have been varied almost infinitely. Nevertheless, the same *motive* is apparent in nearly all of them. If, now, a company intending to build cars should offer premiums for the best designs for the head linings, it might secure the greatest variety in the patterns and call out a different kind of talent from that which it can hire for from three to five dollars per day. There are many young and unemployed artists who might thus supply themselves with bread and butter, when other orders more to their taste are not forthcoming.

The Harlan & Hollingsworth Company is now employed to its full capacity, in both car and ship-building departments. As stated before, it is about to enlarge the capacity of the former, to meet the demand for cars which the rapid extension of new roads and increase in the traffic of the old have created.

They are equally busy in the marine department, and have completed a side-wheel iron ship, of 1,500 tons, for Mr. Charles Morgan, of New Orleans, which was the twenty-fourth ship built for him at this shop. They have now two of 2,500 tons each, on the stocks for the Pacific Mail Steamship Company, so that there are indications that American ship building is not quite dead yet.

The Weight of Cars.

A correspondent sends us the following very useful data regarding the weight of cars on the Pittsburgh, Fort Wayne & Chicago Railway:

"The standard passenger coach on this road weighs 47,350 lbs., it will seat fifty passengers; distance from center to center of seats, 36in. (giving ample room for passengers); length of seat inside of arms, 38½in.; width of seat, 17½ inches. These cars have six-wheeled trucks, one of which weighs 9,340 lbs. (The trucks are included in the "weight of coach.") The axles are steel, one of which weighs 332 lbs.; the wheels are broad-tread, weighing 548 lbs. each. These cars were built for comfort and to run at high rates of speed. I do not think they could be lightened much and be as safe in case of accident as they now are. Six-wheeled trucks are used for safety and for making an easy riding coach.

"One flat car weighs 14,410 lbs.; the floor (or loading area) is 8ft. 11½in. wide, 28ft. 1in. long. To start one of these cars (empty) requires a force of 150 lbs.; to keep it moving after started, 50 lbs. (measured by a dynamometer).

"One box car weighs 17,000 lbs.; inside measurement, in the clear, 7ft. 9in. wide, 27ft. long and 5ft. 11in. high. To start it (empty), requires 250 lbs.; to keep moving, 50 lbs.

One stock car weighs 17,000 lbs.; inside measurement in the clear, 8ft. 1½in. wide, 27ft. ½in. long, and 6ft. ½in. high. To start (empty) requires 250 lbs., to keep moving 50 lbs. The dynamometer used was a "home-made" one, and was pretty accurate according to our tests.

"The flat, box and stock cars all have the same kind of truck, the weight of which is 3,915 lbs.; one axle weighs 295 and one wheel (broad-tread) 570 lbs. The trucks will run on a 4ft. 10in., 4ft. 9½in., 4ft. 9½in. and 4ft. 8½in. gauge of track. The load allowed to be carried in these cars by rule of company is 20,000 lbs. It is a common occurrence for them to be overloaded. I have known 32,000 lbs. to be loaded on one of our flats. We are well aware they will carry more than 20,000 lbs., but think that to be a safe load.

"The weight of one Pullman sleeper is 55,400 lbs. To start this car, took a power of 800 lbs., to keep moving 250 lbs.

"We have on one of the branches some light coaches that will seat thirty people, weighing (the coach not the people) 21,450 lbs. These cars I do not consider safe to run at a higher speed than 15 miles per hour; when that speed is exceeded they jump so badly that there is danger of their leaving the track."

Record of Track Increase.

The news contained in this week's paper gives information of the following additions to the track of new and old railroads: *Sugar River*, from Newport west to Claremont, N. H., 15 miles. *Port Royal*, from Hoober's northwest five miles to Allendale, S. C., 55 miles from Beaufort. *Wisconsin Central*, from Stevens' Point westward 20 miles. *Paris & Danville*, extended about 15 miles toward Danville, Ill., to the Little Vermillion, 25 miles from Paris. *Bedford & Bridgeport*, completed from its late terminus, 15 miles southwest of Mount Dallas, Pa., southwest to its junction with the Cumberland & Pennsylvania Railroad, at Kreigbaums, 3½ miles northwest of Cumberland, a distance of sixteen miles. *St. Louis & Iron Mountain*, Arkansas Division, extended from Mill Spring, the winter terminus, south 28 miles to Poplar Bluff, Mo., 87 miles from Bismarck (the junction with the main line) and 162 miles from St. Louis. *Intercolonial*, from Amherst east by south 26 miles to River Philip, N. B. *Detroit, Eel River & Illinois*, extended from the recent terminus at Roann, Ind., westward about eight miles to a junction with the Indianapolis, Peru & Chicago Railroad. *Indiana & Illinois Central*, completed across Douglas County, Ill. (from east to west), 30 miles. *Perkiomen*, extended to Green Lane, Pa., six miles north of the former terminus at Schwenksville. It is worked by the Reading Company. *Kent County*, extended from Chestertown southwest to Fairlee, about five miles. *Houston & Texas Central*, extended from Corsicana north to Dallas, 50 miles. *Milwaukee & St. Paul*, track laid on about 14 miles of the new line between Milwaukee and Chicago. *Savannah & Memphis*, extended from its recent terminus at Dadeville, Ala., northwest about ten miles. *Atchison, Topeka & Santa Fe*, extended from the recent terminus at Raymond westward about 40 miles to Fort Larned, Kan.

The total increase of track reported this week is 288 miles. The work of track-laying is now fairly at its height, there having been sufficient time since the opening of the season to prepare road-beds. Much of the track-laying here recorded was done some time ago, but is announced at this time on the completion of lines or sections, or distances between towns.

THE IMPORTANCE OF GRAIN as a source of traffic to the railroads of the Northwest is very well shown by the assessment returns for 61 of the 101 counties of Illinois, recently published, which gives in separate columns the acreage of wheat, corn, and "other field products" in cultivation the present season. From this it appears that these counties—about three-fifths of the State—have 1,130,000 acres of wheat, 4,754,000 acres of corn, and 1,624,000 acres of "other field products." Thus the two grains named cover more than three-fourths of the entire area cultivated; and of the remainder a larger space is devoted to oats, doubtless, than to any other crop. Of course not all of this grain is exported; if it were, the railroads would be overwhelmed. If this proportion extends to the other counties of the State (some of which are unexcelled in extent and productiveness), we may reasonably expect that Illinois will produce this year about 23,000,000 bushels of wheat and 200,000,000 bushels of corn. There will be for export something like 8,000,000 bushels of wheat (in the form of flour, whisky or grain). The amount of corn for export it is impossible to estimate; but it is probably less than one-fourth of the product, as it is the great staple grain for the support and fattening of the stock of the State. The shipments of stock as well as of grain depend largely on the crop of grain, and as these together form about four-fifths of the east-bound traffic of the railroads of the Northwest, it is plain that their prosperity depends very much on the grain crop.

THE ERIE RAILWAY COMPANY, it is reported (with how much truth we cannot say), has appropriated $750,000 for the payment of the expenses of the reorganization, or the ousting of the Gould administration, and it is also reported that among these expenses are the payment of $60,000 per year to the late President and $40,000 to the Vice President, not, as it appears, in payment of services, but to induce them to discontinue those services. We know of several men who would be willing to receive $60,000 a year for *not* working; and perhaps there is more than one company which could afford to hire their officers to cease their labors at that or a higher rate.

Contributions.

The Northern Pacific Railroad.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I extract from "Miscellaneous Document No. 228," Second Session Forty-second Congress, accompanying a partial report from the Committee of the House on the Pacific Railroad, some facts which appear interesting, if not singular. It would seem from the report that the labors of the Committee, which was appointed to *investigate* the affairs of the company, were limited to receiving the statement of its President, J. Gregory Smith, Esq. Certain "prepared" questions were put to him, which, with his answers, constitute the entire substance of the report, excepting a few laudatory remarks, not a single other witness having been examined.

The 34th question is in these words: "Furnish the Committee with a list of the stockholders of the company, and the amount of stock held by each, with the total amount of stock issued, or authorized to be issued." The answer to this is: "42,416 shares, or $4,241,600, in shares of $100 each;" of which, held by

Jay Cooke & Co.	23,188	shares
H. D. Cooke, in trust	23	"
Dora E. Cooke	22	"
Jay Cooke, trustee	168	"

—giving Jay Cooke & Co. absolute control of the road and the company; in addition to which, their friends, the Messrs. Morehead, hold.

	462	shares
H. McCulloch, their partner	19	"
Thomas A. Scott, the ubiquitous	224	"
S. P. Chase	56	"
J. Gregory Smith, President	979	"
Do. Trustee	1,552	"
Chicago & Northwestern Railroad Co.	389	"
J. W. Geary, the Governor	112	"
Rev. H. W. Beecher	18	"
H. C. Bowen, New York *Independent*	56	"
T. A. Biddle	56	"
J. Edgar Thomson	1,046	"
Bowen & Fox	112	"
H. S. McComb	112	"
Johnson Bros. & Co.	56	"
Wm. Thaw	473	"
J. A. Wills (Cooke's Washington attorney)	94	"
John L. King	112	"
M. Baird & Co.	103	"
S. M. Felton	51	"
A. Whitney & Sons	103	"

besides others—constituting a snug little party; but all under the control of J. C. & Co., whose lion's share will enable them to put in and put out whom they choose in the directory, and prevent any inconvenient inquiries as to the uses to which the funds of the company are put.

By another question, Mr. President Smith is requested to set forth fully the financial condition of the company. His answer is in "the words and figures following, to wit:"

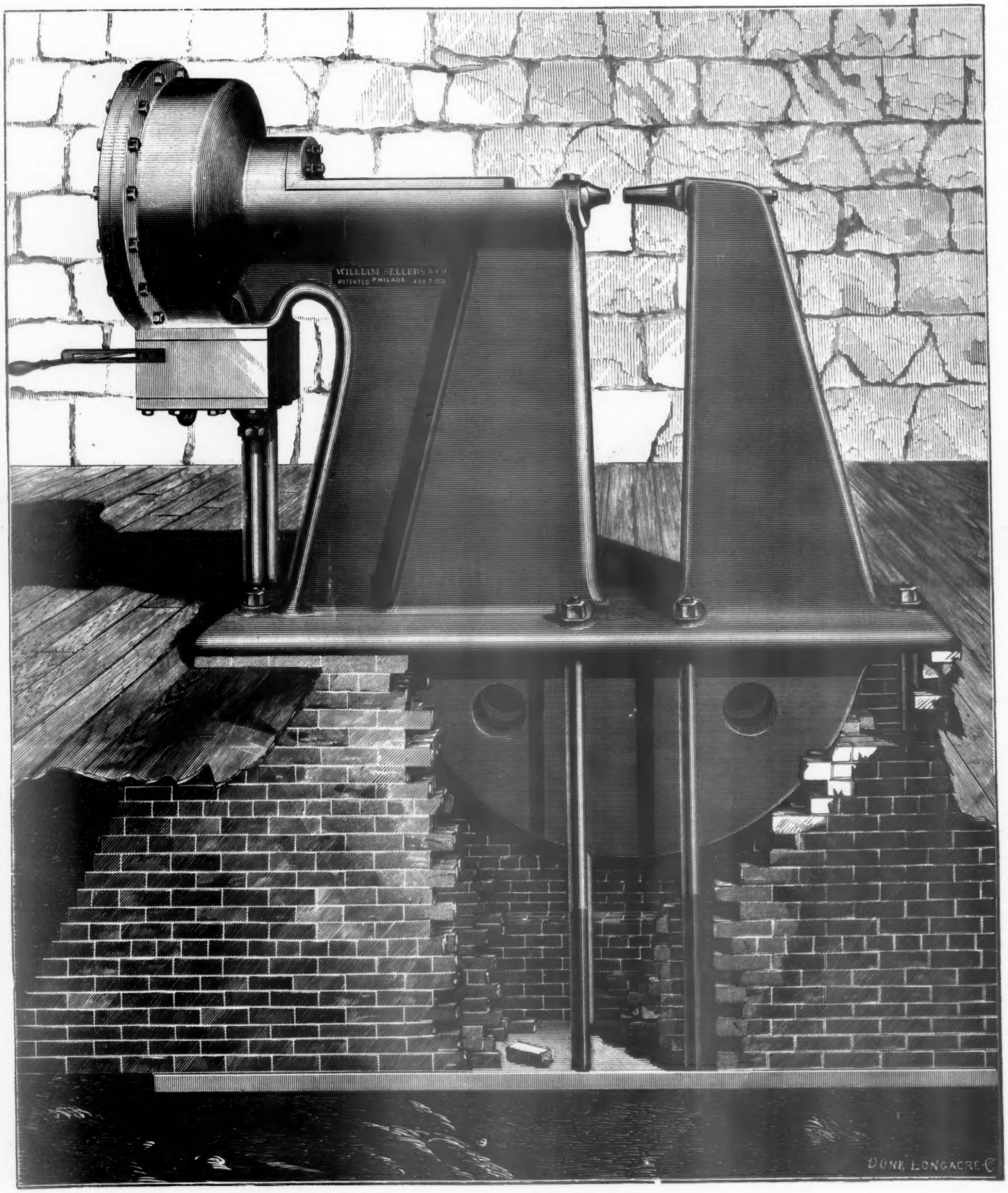
"The following statement from the company's books will show it:

Amount proceeds of bonds sold	$11,555,870 00
Balance account, interest and discount	13,185 88
Bills payable for materials furnished	747,644 65
Total	$12,316,700 53
Expended for surveys	$740,976 54
Expended for construction, including rails, spikes, etc., on hand	6,933,008 09
Expended for Land Department	79,631 42
Expended for rolling stock	691,336 70
Expended for general expenses	147,956 71
Expended for operating expenses	115,147 11
Expended for interest on bonds and payment of coupons	1,076,635 63
Assets and bills receivable	1,518,36 83
Jay Cooke & Co.	610,075 45
Cash on hand and in the hands of disbursing agents, etc	403,596 03
Total	$12,316,700 53

The reader of this statement of the financial condition of the company, "from the company's books," will be struck with the fact that not a dollar has been received from the business of the 232 miles of finished road, although $115,147.11 is charged as "operating expenses," nor a dollar from the stockholders on account of the stock issued to them, although the charter imperatively calls for a payment of 10 per cent. down at the time of subscribing.

In the President's answer to the 40th question, as to the average monthly sales of the bonds for 18 months past, he gives it as $774,733.33 per month—the highest in any month being $2,013,400, and the lowest $270,300.

In another answer he mentions a loan of four millions sterling (about twenty millions of dollars) as having been put upon the London market, and which was selling at 99.78; and in an-



DIRECT-ACTING STEAM RIVETING MACHINE,

By WM. SELLERS & CO., PHILADELPHIA.

other he states that the total sales of dollar bonds was $13,945,-200. In the statement quoted above he gives the total receipts from these bonds as $11,555,870—showing a difference of $2,389,330, or about 20 per cent., for commissions, advertising, &c., provided the same period of time is embraced in both cases.

His answer to the 9th question gives the cost of the road and superstructure, on 229 miles of the eastern end, as $23,571 per mile, and on the western end, for 25 miles, $28,560 per mile. As the mortgage is to the amount of $50,000 per mile under which the bonds are now being sold, there would seem to be, after making a large allowance for rolling stock, etc., a very pretty margin for *somebody*, *somehow*, over and above the enormous commissions and shaves to which the company is notoriously subjected, besides the cost of buying up the press, especially the religious branch of it, to assist in shoving the bonds. Reading their innumerable and clamorous puffs, I see they dwell very unctuously upon the superiority of these bonds, as an investment, to those of the United States, because of the higher rate of interest. If my memory serves me rightly, this does not altogether harmonize with the representations of Messrs. Cooke & Co. when they were blowing up the Government's 7.30 loan. People's memories are rather short sometimes.

There is an air about these questions put to Mr. President Smith which is redolent of the kitchen where they were Cooked. Still the odor is decidedly rich, which makes me grieve that the 31st question was entirely overlooked and left unanswered. Perhaps it was reserved for the purpose of filling up the chinks, and forgotten. My supposition is that it was intended just there to ask something about the average monthly balances retained by Jay Cooke & Co. in their own hands and in the hands of "disbursing agents." These items in the financial statement amount to more than a million, besides a mysterious item, "assets and bills receivable," of more than a million and a half.

On the whole, that statement may be safely pronounced to be as clear as mud, and Wall street mud at that. It may be deemed singular, but it is far more suggestive than strange. It is stranger far, however, that a committee of the House of Representatives of the United States should allow themselves to be converted into a bellows for blowing *Jay Cooke & Co.'s bonds*. I call them so deliberately, as that firm is *de facto* President, directors and company, with none to call them to account for the disposition made of the proceeds of their sale. I speak with reference to the principle involved, not to disparage these gentlemen as honorable men, as the world goes; but I must say that, occupying the position they do, it is asking too much, upon mere business principles, to challenge the confidence of the public in bonds the agents for which are not amenable in the slightest degree to anybody.

After reading this report (if, indeed, it may be so called), I could not refrain from laughing when I recurred to the name of the member who presented it. That name is "Sypher." How significant, and, as regards this report, how suggestive!

There are many other reflections which arise from a reading of this document, and to which I may hereafter give expression; but, for the present, I forbear.

The objections which I have made to the financial statement may be susceptible of being explained away, but to plain people they appear to be valid. Is it possible that the finished part of the road has yielded nothing? Is it true that, upon $4,241,600 of stock issued not a cent has been paid? Is this stock made presents of to the parties named as its holders? How has the charter, which requires ten per cent. to be paid down, been complied with? What means the large item of "assets and bills receivable?" Is the company engaged in money-lending?

Eastern Engineering from a Western Point of View.

Some time since an article appeared in this journal with the above title, which I read with a good deal of interest; and having come East, I thought your readers might like to hear some of my impressions of the way things seem to be done in Massachusetts. During the last year there has been erected at the beautiful village of Groveland, Essex County, a wrought-iron roadway bridge over the Merrimac River, which I made an examination of the other day, and of which I will give you a short account.

The river is at this place about 800 feet wide, and the bridge consists of six spans and a draw, the latter, with three spans on each side, has about 40 feet opening, and of that more hereafter. The piers are placed 127 feet from center to center in all but the draw opening, and the spans are about 124 feet in the clear. The masonry, which is all very good, is of the granite so common on the coast of New England, and is evidently solid work and in good taste.

The roadway is carried in each span by two wrought-iron bowstring trusses, placed about 25 feet apart. The arch, or bow, of each truss is built in a box section of two vertical plates, and two horizontal channel-bars are so placed at the upper and lower edges of the plates as to bring the flanges outward.

The plates are 13x5-16 in. and the channels are 7½x2½x⅜ in. The rise of the arch is about 11¾ feet, being a little less than 1-10 of the span.

The bottom chord or tie is in each truss made of two flat bars each 6x1 in. placed on edge. At the ends of the span these are drawn down to 2 in. round rods, on which are cut threads passing through a nut at the back of a cast-iron skew-back; this last receives the heel of the arch.

The bracing is made with verticals of cross iron 3½x3½x½ in., and with the two diagonals of every panel of ¾ in. round rods; these are all attached to the chords by screw ends, nuts, and cast-iron bearing blocks.

The cross beams are of wood, 4x16 inches, spaced 2 feet between centers, notched over and carried by the bottom chord. Four of these cross beams extend beyond the others on each side, and carry a cross iron strut up to the arch. There are ⅝-inch rods forming the diagonals of a double system of lateral bracing under the flooring. The latter is of 4-inch plank laid longitudinally. There are also four panels of lateral bracing carried by cast-iron standards above the arch.

This bridge appears to be almost criminally light to me, and I will very briefly show the process by which I arrive at this conclusion. The weakest part of the structure appears, at first sight, to be the ends of the main tie rods. The collective area of these rods is 12.5 square inches, which at a safe tension of five tons per inch gives 52.5 tons as the working tension of the tie. With the proportions used in this bridge, this tension is inevitably obtained by a distributed load of 50 tons. By computation from the data given, it will be found that the weight of the flooring is about 25 tons, the chords over 12 tons, and if we call the bracing and fastenings four tons, we shall have a total of 41 tons for the weight of the bridge itself, leaving 9 tons as the safe distributed working load, or 4½ tons as the safe central working load. Although, of course, a greater load than this might be supported, yet the life of the structure with a heavy fall of wet snow, a crowd of people and a steam fire-engine either in motion or at rest when working, would seem hardly possible, and these suppositions could easily be realized at the same time.

About a month after this bridge had been accepted by the County Commissioners, as the draw, which lifts in two leaves, was being raised to allow the passage of a vessel, the hoisting gear failed and one of the pieces fell from a height of six inches, and was only stopped in its descent by the bottom of the river. After this the hoisting gear was all replaced, but some six or more weeks time was consumed.

Some so-called engineer appears to be to blame, and the Commissioners appear to be at fault in employing such an engineer.

CHAS. A. SMITH.

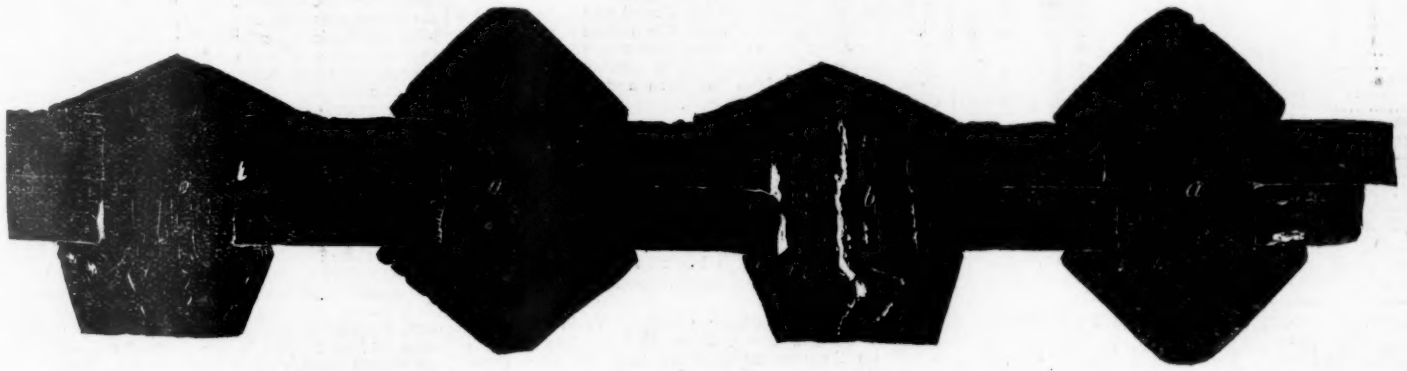
Direct-Acting Steam Riveting Machines.

In presenting a full-page illustration of the steam riveting machine designed and built by Messrs. William Sellers & Co., of Philadelphia, we take occasion to make a few remarks on the principles involved and the practical use of such machines. What is manifestly required in perfect riveting is, that the metal of the rivet while hot and plastic shall be made to flow into all the irregularities of the rivet holes in the boiler sheets, that the surplus metal be formed into heads as large as need be, and that the pressure used to produce these results should not be in excess of what the metal forming the boiler shall be capable of resisting.

It is well known that metals, when either cold or hot, if subjected to sufficient pressure, will obey almost exactly the same laws as fluids under similar conditions, and will flow into and fill all the crevices of the chamber or cavity in which they are contained. If, therefore, a hot rivet is inserted into the holes made in a boiler to receive it, and is then subjected to a sufficient pressure, it will fill every irregularity of the holes, and thus fulfill one of the conditions of perfect riveting. This result it is impossible to accomplish with perfection or certainty by ordinary hand riveting, in doing which the intermittent blows of an ordinary hammer are used to force the metal into the holes. With a direct-acting steam riveting machine, however, an absolutely certain and continuous pressure can be imparted to each rivet, so as to force the hot metal of the rivet into all the irregularities of the holes, in the same way as a hydraulic ram will cause water to fill any cavity, however irregular. In order to test and also illustrate the relative advantages of machine and hand riveting, we have had two plates riveted together, the holes of which were purposely made so as not to match perfectly. These plates were then planed through the center of the rivets, so as to expose a section of both the plates and rivets.* From this an impression was taken with printer's ink on paper and then transferred to a wooden block, from which our engraving was made. *a*, *a* were put in by one of Messrs. Wm. Sellers & Co.'s machines, and *b*, *b* by hand. It will be observed that both of the machine rivets fill the holes completely, while the hand rivets are very imperfect. The experiment was tried several times with similar results each time.

The hand rivets, it will be observed, fill up the holes very well immediately under the head formed by the hammer; but not sufficient pressure could be given to the metal—or at least it could not be transferred far enough—to affect the metal at some distance from the head. So great is this difficulty that in hand riveting much shorter rivets must be used, because it is impossible to work effectively so large a mass of metal with hammers as with a machine. The heads of the machine rivets are, therefore, larger and stronger, and will hold the plates together more firmly than the smaller hand-riveted heads.

Direct-acting steam riveting machines give a uniform force, if the steam pressure used be uniform, and they give such pressure as is needed, regardless in a measure of the amount of metal forming the rivet. These machines have been made on two general principles. In the English machines, a comparatively light piston of large diameter acting upon a not very large or heavy riveting ram is made to do its work by the pressure of steam alone. In the machine illustrated a very heavy piston and riveting ram are made to do the work by the combined effect of steam pressure and momentum. The ram and piston are of wrought iron in one solid forging, and weigh when finished over one ton. With the increased weight of the riveting ram a less diameter of steam cylinder is needed. Thus it is said that one of these machines with a steam cylinder 31 inches in diameter working alongside of an English machine with a steam cylinder 36 inches in diameter does the same kind of work from the same steam boiler, and yet requires a shorter stroke, thus using less steam to accomplish the same result. In practice, it has been found that for locomotive boilers using



⅞-in. rivets about 60 pounds pressure per square inch does the best work.

The machine illustrated is so arranged as to enable all the rivets about the ordinary locomotive boiler to be driven with ease; that is, it will rivet the corner seams of the fire-box and drive the rows of rivets where the waist joins the outer shell of the fire-box. In the practical working of this machine it may be well to mention that the rivets are inserted from the outside of the boiler, not, as in hand riveting, from the inside. The boiler, suspended in slings attached to a crane, is drawn up to the riveting hammer, and the first blow struck carries the boiler pushed by the rivet-head up to the post, and thus tends to close up the sheets as the head is being formed on the inside of the boiler. The second blow is then delivered with the boiler pressed up to the post or stake, and the steam pressure retained until the rivet has had time to cool. Thus two blows are given to each rivet; and in this manner, allowing time for each rivet to cool under pressure, five rivets per minute can be driven. The arrangement of valve is such as to enable the charge of steam used in riveting to be utilized in its expansion to draw back the ram.

* We are indebted to Mr. Grant, proprietor of the Grant Locomotive Works, for the use of his machine and tools in making these experiments.

Driving Wells for Construction Parties.

The Hutchinson (Kansas) *News* says that a novel but highly successful expedient has been adopted by Mr. Criley, Superintendent of construction of the Atchison, Topeka & Santa Fe Railroad Company, for supplying his boarding trains and track-layers with pure cold water. Providing himself with three drive wells, he placed one at the end of the track and the others along the line in advance, one mile apart. An experienced well driver was obtained in Hutchinson, and he contracted to take up, carry forward and drive again, two pumps per day, removing one after the morning supply was obtained at the boarding train and carrying it forward one mile beyond the farthest pump. After dinner, for which the train moves forward one mile to the next pump, this pump is carried forward again to the front; and thus the men are constantly and cheaply supplied with fresh water. Excepting a few miles of the line beyond Cow Creek, one hundred miles west of Hutchinson, where the road leaves the valley and cuts off a bend in the Arkansas, striking it at Fort Dodge again, the pumps can be driven all the way to the State line, a distance of 280 miles. What other railroad line in the world can boast of a similar advantage, and where else is there so long a row of pumps?

General Railroad News.

CHICAGO RAILROAD NEWS.

Chicago, Rock Island & Pacific.

This company has recently made new rates for commutation tickets. The family commutation tickets are issued only to heads of families, and are good only for immediate members of those families and their servants, and are not transferable. The following family tickets are good only on the "dummy train," which runs over that part of the line where nearly all the suburban towns are:

Family Commutation Tickets.
(Good only on Dummy Train.)

Between Chicago and	Miles from Chicago.	[25] Ride Tickets.	[50] Ride Tickets.	[100] Ride Tickets.
Company's Shops	4¾	$1 00	$3 15	$6 25
Englewood	6½	2 50	4 50	8 00
Normal School	7¼	2 75	5 00	9 00
Seventy-first street	7½	2 90	5 25	9 60
Sheridan Avenue	8½	3 30	6 05	11 00
Comorn	9¾	3 75	6 90	12 50
Glendale	10¾	4 00	7 30	13 25
Dummy Junction	11¾	4 35	7 95	14 50
Washington Heights	12	4 50	8 25	15 00
Prospect avenue	12¼	4 50	8 25	15 00
Tracy avenue	12¾	4 50	8 25	15 00
South street	13¼	4 80	8 80	16 00
Morgan avenue	14	5 10	9 35	17 00
Vincennes road	14½	5 25	9 60	17 50
Burr Oak avenue	15½	5 40	9 90	18 00
Young's Grove	15¾	5 40	9 90	18 00
Blue Island	16	5 55	10 20	18 50

The following family tickets are good on any trains, and are the places beyond the point where the old way train runs:

Family Commutation Ticket

Between Chicago and	Miles from Chicago.	Local Rate.	[30] Rides 1 Month.	[30] Rides 2 Months.	[30] Rides 3 Months.
Blue Island	16	$0 65	$9 75	$12 21	14 60
Bremen	24	0 95	14 25	17 80	21 40
Mokena	30	1 20	18 00	22 50	27 00
New Lenox	34	1 35	20 25	25 30	30 35
Joliet	40	1 60	24 00	30 00	36 00
Minooka	51	2 05	30 75	38 45	46 15
Morris	61	2 35	35 25	44 10	52 90
Seneca	71	2 65	39 75	47 30	59 65
Marseilles	76	2 80	42 00	52 50	63 00
Ottawa	84	3 00	45 00	56 25	67 50
Utica	94	3 40	51 00	64 75	76 50
La Salle	99	3 55	53 25	65 55	79 90
Peru	100	3 60	54 00	67 50	81 00

The individual tickets are good only for the transportation of the persons in whose name they are made out:

Individual Ticket.

Between Chicago and	Miles from Chicago.	Rate for [3] Months.	Rate for 1st [6] Months.	Rate for 2d [6] Months.	Rate for One Year.
Englewood	6½	$14 00	$25 00	$24 00	$45 00
Normal School	7¼	16 00	28 00	26 00	50 00
Washington Hts	12	20 00	35 00	32 00	60 00
Prospect ave	12¼	20 00	35 00	32 00	60 00
Tracy avenue	12¾	21 00	36 00	33 00	62 00
Morgan ave	14	22 00	38 00	35 00	65 00
Blue Island	16	24 00	41 00	37 00	70 00
Bremen	24	28 00	50 00	47 00	90 00
Mokena	30	31 00	55 00	52 00	100 00
New Lenox	34	33 00	58 00	54 00	105 00
Joliet	40	35 00	60 00	57 00	108 00

The Joliet yearly ticket, to one who makes the round trip every week day, is at the rate of less than half a cent a mile.

Besides these, there are sold 100-ride family tickets for $22 between Chicago and Washington Heights, and for $29 between Chicago and Blue Island—at the rate of 11 cents for the trip of 12 miles and 14½ cents for the trip of 16 miles.

There is some very beautiful ground on the line north of Blue Island, and as trains run almost to the heart of the city, there would seem to be an opportunity to build up a large suburban business.

Chicago, Burlington & Quincy.

The double track is down between this city and Downer's Grove, and is in operation. The Prophetstown Extension (Prophetstown to the Mississippi, opposite Clinton) was opened on the 22d of July. A ferry is employed to transfer goods and passengers to the Iowa side. The company expect to make an arrangement with the Chicago, Clinton & Dubuque road to carry its business as soon as it shall be complete to Clinton. It is now done within about seven miles of that place. Within the past week three new engines have been received, and within a week half a dozen more are expected. The company is actively prosecuting the surveys for a new railroad bridge at Clinton. The plans are being prepared.

Lake Shore & Michigan Southern.

This company is pushing forward its road from Albion to Lansing as rapidly as possible. The road is ballasted seven miles beyond Albion, and it will be finished to Eaton Rapids about the 20th of August. The intention now is to have the road done to Lansing by the first day of October. The road will enter Lansing at the northwest corner of the city. Ample grounds have been secured for the business for at least twenty years. Fine buildings are in course of construction along the entire route from Albion to Lansing. The business of this branch is opening finely, and exceeds the expectations of the company. A new round-house is in process of construction at Air Line Junction, near Toledo, and here a large amount of land has been secured, upon which the freight transfer tracks will be laid. The old "Middle Ground" is still to be used, and has had added to its sidetracks during the past year about one-fifth more track. The great depot which is in process of construction for this and the Chicago, Rock Island & Pacific companies has the walls of the depot proper completed on the west side. On the Van Buren street front the workmen are building the second story. The building already has a very fine appearance, the stone being smooth and almost of the whiteness of Vermont marble.

Chicago & Alton.

On Monday, July 29, the general offices were removed to the new building on the corner of Charles and Van Buren streets. Everybody appeared to be extremely happy as a result. The offices are extremely convenient and commodious.

Chicago & Pacific.

This company is actively engaged in grading for its track from this city westward. At a recent meeting in Elgin, very favorable terms were granted the company for admission to that city, and a large amount was subscribed to the stock.

Milwaukee & St. Paul.

About 14 miles of track have been laid between this city and Milwaukee, and the most of the route is graded to within about seven miles of this city, and the work is being pushed with great energy.

Pittsburgh, Fort Wayne & Chicago.

The General Western Passenger Agent, Mr. W. C. Cleland, has just returned from a trip to the Arkansas Hot Springs, very much improved in health.

Chicago & Northwestern.

Mr. G. H. Heafford, Chief Clerk in the General Ticket Agent's office, has accepted the appointment of Assistant General Passenger Agent of the Missouri Pacific & Atlantic & Pacific Railroad Company. Mr. A. A. Little succeeds him in the Chicago office. Mr. Hatch, the agent at the South Branch transfer house, has been succeeded by S. A. Baldwin, formerly Ticket Agent at Janesville. The month of August has already been booked for eighteen excursion trains on this road.

Illinois Central.

The peach train was started from Carbondale on this road last week. There is plenty of peaches at the south, but there is an unusual tendency to decay.

Chicago, Danville & Vincennes.

Mr. Charlesworth, recently appointed General Superintendent of this road, is reducing affairs to a good state of discipline. Eighteen miles of road on the new branch will shortly be opened, when the Indiana coal will be brought to the city on a much shorter route than at present. This company has made a contract to supply the Lake Shore & Michigan Southern and the Pittsburgh & Fort Wayne engines with coal.

ELECTIONS AND APPOINTMENTS.

—Col. C. N. Pratt, formerly of the National Land Company, and one of the first to establish the "colony system," with which he has been very successful, has been appointed Land Agent of the Atchison, Topeka & Santa Fe Railroad, which has now a million acres of lands in the market, and expects soon to have five millions more.

—Mr. J. J. Frey, until recently Chief Train Dispatcher of the Missouri, Kansas & Texas Railway, has been promoted to be Superintendent of the Osage Division of that road (Holden, Mo., to Paola, Kan.) Mr. Frey has risen rapidly from the position of telegraph operator, and is now but 24 years of age.

—It is reported that Gen. Alexander S. Diven, Vice-President of the Erie Railway Company, has been appointed General Manager of the road, and that instead of a general superintendent he will have the responsibility of the working of the road, having as his immediate lieutenants a superintendent of transportation, a superintendent of machinery, and a superintendent of track, or engineer—a very good distribution, and very like that of the Baltimore & Ohio, and, indeed, of many roads, except that the general superintendent is now commonly the superior officer of those in charge of road and rolling stock.

—At a meeting of stockholders of the Laclede & Fort Scott Railroad Company, held in Bolivar, Mo., July 17, and claiming to represent the legal organization of the company, the following directors and officers were chosen: H. T. Wilson, Fort Scott, Kan.; J. N. B. Dodson, Vernon County, Mo.; B. F. Pollard, Cedar County, Mo.; John W. Ross, Polk County, Mo.; G. W. O'Bannon, Dallas County, Mo.; H. Attaway, Laclede County, Mo.; Francis C. Rozier, St. Genevieve, Mo. President, J. N. B. Dodson; Vice-President, John W. Ross; Secretary, James Dumars; Treasurer, T. H. B. Dunnegan; Attorney, R. P. Bland; Chief Engineer, John Runk, Jr.; Executive Committee, J. N. B. Dodson, H. T. Wilson, B. F. Pollard.

There was another election June 17, by another party, in the interest, it is supposed, of the "Laclede Contractors," who also claim to control the company.

PERSONAL.

—Mr. John H. Miller, long General Eastern Passenger Agent of the Pennsylvania Railroad Company, died at his residence in New York July 20, after a short illness. Mr. Miller was in the fortieth year of his age. He had been for a long time in the service of the company, and was highly esteemed as a faithful officer and good citizen.

—Mr. Richard Potter, President, and Mr. J. M. Grant, Secretary, of the Grand Trunk Railway Company, and Mr. James Allport, General Manager of the Midland Railway, all of London, arrived in New York July 30, where they were joined by Mr. C. J. Brydges, Managing Director of the Grand Trunk. They are to inspect the Grand Trunk Railway.

—Harlow W. Chittenden, formerly General Superintendent of the New York Central Railroad, died of heart disease at his residence in Syracuse N. Y., July 24. Mr Chittenden's experience as a railroad man began on the Utica & Schenectady Railroad, where he was first brakeman and then conductor. After the consolidation of this road with the New York Central in 1853, he became Superintendent of the Middle Division. In 1861 he was transferred to the Western Division, and on the retirement of Chauncey Vibbard he was made General Superintendent, which position he held until the retirement of Erastus Corning from the presidency and the accession of Commodore Vanderbilt.

—It is reported that P. B. Groat, long General Ticket Agent of the Hannibal & St. Joseph Railroad, will accept a similar position on the Atchison, Topeka & Santa Fe.

TRAFFIC AND EARNINGS.

—The receipts of the Great Western Railway of Canada for the week ending July 5 were: 1872, £21,471; 1871, £16,236; increase, £4,235, or 24½ per cent.

—The receipts of the Grand Trunk Railway for the week ending July 6 were: 1872, £33,000; 1871, £31,300; increase, £1,700, or 5½ per cent.

—The earnings of the Kansas Pacific Railway for the second week in July were: From passengers, $31,443; from freight, $53,269.77; from mails, $1,400; total, $86,112.77. Of this amount, $1,136.08 was for transportation of troops and government freight.

—It is officially stated by the managers of the Western Union Telegraph Company, in connection with their proposition for a loan of $1,500,000 in London, that the gross receipts of the company have been for the years

1868	$7,264,853
1869	7,271,918
1870	7,323,430
1871	7,923,562
And from May 1, 1871, to May 1, 1872	8,251,694
And the net profit for the latter period	2,697,816

OLD AND NEW ROADS.

International Bridge.

The Buffalo *Commercial Advertiser* says: "On Saturday, July 13, the coffer-dam for abutment No. 6 of the International Bridge was sunk to its position in thirty-three feet of water. This dam, in shape and plan of anchorage, was designed and placed by Capt. Otto Meyer, of New York. The iron spans having been constructed some time ago, the utmost nicety was required in placing the novel structure in position. The difficult task has been successfully performed, and, as was to have been expected, Capt. Meyer received the enthusiastic congratulations of the officers of the Grand Trunk and Great Western railways on the occasion. The despondency which existed by reason of the discouraging state of affairs in connection with the construction of the bridge last summer, has now given place to pleasing anticipations, and all looks favorable. Two more piers—Nos. 4 and 5—are to be built without delay, and it is hoped that the bridge will be finished before next winter."

A correspondent of the New York *Herald* gives the following account of the caissons and the process of sinking them:

"Otto Meyer, of New York, was engaged last winter to consruct and sink coffer dams for these three piers. He has been for six months preparing a coffer dam of his own, length 125 feet, width 32 feet, and depth to suit the river, 36 feet, for pier No. 6. It is sharp on both ends; has double sides, closing at the bottom, forming a space three feet wide around the sides for depositing stones, leaving the center of the coffer dam open for the caissons in which the pier is afterward built. The largest anchor, and chains from the navy yards of New York and Montreal were secured, through the kindness of the different departments, and on the 16th instant Captain Meyer's "ship without a bottom" lay moored before eight of the most weighty anchors and chains that have ever gone through a forge, six feet above the position of the pier to be built. At 1 p. m. preparations were made for sinking. Several hundred tons of stones were thrown in the apertures on the side of the coffer-dam until it had sunk within eighteen inches of the river bed. A number of barrels had been arranged previously under water and fastened on the woodwork, their buoyancy lifting the structure about two feet; these were all held by one rope, which being cut, caused the barrels to float and submerge the coffer-dam deep enough to strike the bottom. Six very heavy iron-pointed posts or "spods" running through sheaths or sockets, three on each side, were hoisted and ready to drop.

At four p. m., everything being ready on shore and on board, the craft was quietly let "down stream" by her anchors until the engineer on shore signalled "in position." The flag was raised "all right," and with the order "Cut away," the barrels floated up, the iron spods dropped, burying themselves in the river bed, and with a light shock the coffer-dam rested securely on the bottom of the Niagara, on a deposit of gravel and stones. The gravel and stones have to be removed by a dredge, here ready for the purpose, and superintended by Mr. W. W. Collins. Below the gravel the solid rock is found on which the piers are to rest."

Evansville, Henderson & Nashville.

This company is at last entirely in the control of the St. Louis & Southeastern by the purchase by Messrs. Winslow & Wilson (President and Vice-President of the latter company) of a majority of its shares. The St. Louis & Southeastern by this purchase secures a complete line from St. Louis to Nashville, shorter than any other, Winslow & Wilson having previously purchased outright the Edgefield & Kentucky Railroad—the Tennessee section of the line between Henderson and Nashville. There is a mortgage for only $10,000 per mile on the Evansville, Henderson & Nashville road; it is intended to consolidate the companies and issue a new mortgage, thoroughly equip the southern section, and complete the line from Shawneetown to Madisonville, which will considerably decrease the distance from St. Louis to Nashville and give very easy grades. The distance from Henderson to Nashville is 148 miles, and from St. Louis to Nashville by way of Evansville 320 miles, which will be

reduced to 295 miles by the completion of the Shawneetown & Madisonville line. By the Iron Mountain road, the distance is 380 miles.

Laclede & Fort Scott.

A meeting of stockholders who claim to represent this company was held, according to a previous call, at Bolivar, Mo., July 17, at which President A. C. Mitchell made his annual report. Resolutions presented by R. P. Bland, Attorney of the company, were adopted, to the the effect "that the contracts on the part of Geo. A. Fitch and W. J. Budd with said company, entered into at Lebanon, Mo., on the 22d day of June, 1871, for the completing of said road to Fort Scott, Kansas, and from Lebanon to Ste. Genevieve, on the Mississippi River, known as the Eastern Extension of the Laclede & Fort Scott Railroad Company, and the addenda made to said contracts at Lebanon, Mo., on 8th day of September, 1871, with said Fitch and Budd and a sham organization known as the Laclede Contractors, all and each of them having been obtained by fraud, intrigue and misrepresentation on the part of said pretended Laclede Contractors and said Fitch and Budd; it is therefore declared that all and each of said contracts are void, and that the same be held for naught by said railroad company, and that all acts, records and proceedings of said Laclede and Fort Scott Railroad Company, made with reference to said contracts, be and the same are hereby declared null and void and forever canceled." That any authority granted to the directors to mortgage the road, especially that granted by resolution June 21, 1871, be rescinded; and that the election held in St. Louis, June 17, 1872, at which G G. Merrick, M. Nye, John McDonald, J. E. Clarke, Henry Potwin, Jr., C Harris and C. W. Colehour were declared elected directors of the company, "was a notorious fraud, humbug and swindle." The meeting then chose a board of directors, as elsewhere reported.

Of the merits of the controversy we have no knowledge.

Lafayette, Muncie & Bloomington.

It is reported that creditors of this company are about to institute proceedings in bankruptcy against it. The road from Lafayette to Muncie, Ind., is mostly graded.

Waloomsac Railroad.

The stockholders have leased their road to the Troy & Boston Railroad Company, agreeing to raise and expend in construction $130,000, if the latter will then finish the road and pay three per cent. on the stock, and under certain conditions six per cent. The total cost of the road will be $300,000.

Car Shops Burned.

The blacksmiths' and carpenters' shops of Allison & Co.'s shops, in West Philadelphia, were burned down July 25. The loss was about $200,000, which is covered by insurance.

Savannah & Memphis.

This road is now complete to Sturdivant's, 40 miles from Opelika, and the Alabama State Commissioners have accepted the fourth section of ten miles. The surveying parties have crossed the Tallapoosa River and the line is located as far as Youngsville. The bonds of the road are indorsed by the State to the amount of $16,000 per mile.

Staten Island Railroad.

This railroad, with its equipment, franchises, ferry and ferry-boats, is advertised to be sold to foreclose a mortgage, at the company's office, Vanderbilt's Landing, Staten Island, August 27. The road extends from Vanderbilt's Landing southeast 13 miles to Tottenville, nearly opposite Perth Amboy, N. J. It has three locomotives, eight passenger and six other cars, and five steam ferry-boats. The cost of road and equipment is reported at $381,000, and the first and only mortgage is for $200,000. It is reported that the judgments for injuries caused by the Westfield disaster are the cause of the bankruptcy of the company.

United States Rolling Stock Company.

The following is a summary of the first half-yearly report of this company, for the first half of 1872:

The capital of the company is $5,000,000, of which only one-half has been issued. The business of the company is at present to furnish to railroads in this country, either by selling to them or leasing on hire, every description of railroad equipment and rolling stock. The company as yet have no works of their own, but employ various builders of cars and locomotives to furnish them with rolling stock, which they either sell or lease to railroad companies. The principal contract thus far made is with the Atlantic & Great Western Railroad Company, by which the latter company is to hire rolling stock from the United States Rolling Stock Company for the term of seven years. The rental charged is 75 cents a day for freight cars, $4 a day for passenger cars, $8 a day for locomotives, and $2 a day for baggage cars. Of the $5,000,000 capital of the company $735,361.60 has been expended for locomotives and cars, which are leased at a gross annual rental of $226,725; and contracts have been made with various builders for locomotives and cars to the value of $4,225,000, which takes up $4,960,366.60 of the $5,000,000 capital. It is estimated that the gross annual income from the entire rolling stock, when it is all leased, will be $1,224.525. The rolling stock contracted for with builders will not, however, all be furnished before the first months of 1873, so that the earnings for the present year, it is estimated, will not exceed $354,750. In order to meet the maturing payments for rolling stock which builders are to furnish the company, the board of trustees have decided to issue at once the balance ($2,500,000) of the capital stock originally subscribed. The income of the company up to June 30, 1872, was $62,043.83, out of which an interim dividend of 3 per cent. according to the date of installment, was declared and paid. Before the first of November next the managers will submit to the stockholders such recommendations as they may determine on in regard to increasing the capital stock. In the closing paragraph of General McClellan's report he says: "It will be seen that the company's operations promise net earnings exceeding twenty per cent. per annum on the capital employed, but shareholders are reminded that, by the terms on which this company was constituted, the Atlantic & Great Western Railroad is entitled to a rebate of two-fifths of all profits over twelve per cent. The absolute dividend is large and well secured, while the rebate, whether arising from the business of the Atlantic & Great Western or other railroads, gives the Atlantic & Great Western such liberal returns as will reduce the rental on their rolling stock to an amount scarcely exceeding the interest on their money."

Chicago, Danville & Vincennes.

A correspondent states that work on the Indiana Division is progressing rapidly. A section of 10 miles south from Covington was graded last year and the rails are now being laid on it by the company. From that point to Brazil, and from Covington to the junction with the main line, all the force available is employed, and it is expected that the work will be completed in three months. The line passes through valuable coal fields in Coal and Sugar Creek and in Raccoon Valley before striking the block coal field at Brazil. Mr. J. B. Brown, of Chicago, is contractor for the new work between Covington and Brazil.

Chicago, Dubuque & Minnesota.

The Turkey River Branch will run two and one-quarter miles west of Fayette, instead of going through the town. The route through Fayette would be much more costly than the line adopted.

St. Joseph & Atchison.

This road, 35 miles long, is to be completed by September 1, according to the terms of the contract. A large force of men is at work, and the iron has been purchased.

Jacksonville, Northeastern & Southwestern.

This company has purchased, from the Illinois Farmers' Railroad Company, 13 miles of completed road, extending from Jacksonville to the town of Franklin. This purchase gives them a continuous track from Jacksonville to Virden, on the main line of the Chicago & Alton. The price paid was $217,000.

Cincinnati & Indianapolis Junction.

The City Council of Indianapolis has passed an ordinance requiring this company to build machine shops at that place, or a suit will be commenced to recover $50,000. This has reference to a former agreement.

Houston & Texas Central.

The first train entered Dallas, Texas, July 8. This is 50 miles north of the recent terminus at Corsicana and 260 miles north of Houston.

Atchison, Topeka & Santa Fe.

The telegraph announces the laying of the track to Fort Larned, Kan., about 40 miles west of the recent terminus at Raymond.

La Crosse Bridge.

The question of the location of this bridge is still undecided. The Milwaukee & St. Paul Company adheres to its determination to build the bridge two miles above the city, and it is reported that the Chicago & Northwestern Company has declared its intention, if this is done, to build another bridge at the city. Nothing, however, can be said definitely until the board of engineers appointed by the War Department makes its report.

Cairo & St. Louis.

Work is progressing rapidly on this road, about 100 miles of grading being completed. A cargo of iron has been received and track-laying will be commenced at once.

Missouri, Kansas & Texas.

This company has contracted with the town of Chetopa to erect stock-yards there. Chetopa is just on the borders of the Indian Territory, 183 miles from Sedalia.

Mississippi Central Extension.

This company asks for proposals for the construction of the road from Jackson, Tenn., northward to Cairo, the section which is to connect with the Illinois Central and complete an all-rail line between New Orleans and Chicago. Mr. S. B. Reed (under whom the Union Pacific constructed more than 500 miles of road in one year) is the Engineer. Proposals will be received until August 15 at Mr. Reed's office in Jackson, Tenn., for the clearing, grubbing, grading and bridging, the distance being 107 miles. There is a large amount of earth work on the line, and much pile and trestle work.

Pennsylvania—New Jersey Division.

In accordance with the wishes of very many of the commuters on the road, the company has reconsidered its determination to sell none but monthly commutation tickets from New York, and a recent notice announces that "twelve monthly tickets, to be used in twelve consecutive months," will be sold hereafter at the following rates:

Marion	$45 00	Perth Amboy	$77 50
Newark	65 60	Houtenville	75 00
Waverly	65 60	Uniontown	75 00
Elizabeth	65 60	Menlo Park	75 00
Linden	65 60	Metuchen	75 00
Rahway	75 00	Stelton	75 00
Avenel	77 50	New Brunswick	85 00
Edgar's	77 50	Voorhees	85 00
Woodbridge	77 50	Middlebush	85 00
Spa Spring	77 50	East Millstone	85 00

These are substantially the old rates, and by comparing them with the monthly rates, which we published a short time since, it will be seen that a considerable discount is made, especially in the rates to the more distant stations, where the commuters are fewer in number.

The terminal accommodations for freight at Jersey City have been for some time past entirely insufficient for the traffic. The car repair shops have lately been torn down to make room for additional side-tracks, and extensive side-tracks are being laid down at Meadow Switch, west of the Hackensack Bridge and about four miles from Jersey City. These side-tracks will be used for sorting out and storing freight cars until they can be run in and unloaded. These arrangements, however, must be considered as only for temporary use, until the completion of the Harsimus Cove improvements.

The machinery from the car shops has been mostly sent to Bordentown. There is some talk of building a new round house at Jersey City, the present one being entirely too small for the number of locomotives requiring accommodation.

Ten carloads of peaches, the first shipment from Delaware, arrived in Jersey City July 27, and the regular Delaware peach train commenced running this week.

Vicksburg, Shreveport & Texas.

The New Orleans *Picayune* says that the conference lately held between the bondholders of this road, the directors of the North Louisiana & Texas Company and Col. Thomas A. Scott, has resulted in nothing. The object of the conference was to find a basis upon which the suit now pending, as to the title to the Vicksburg, Shreveport & Texas road, could be compromised, and a sale of the road made to the Texas & Pacific Company. It is said that Messrs. Ray and Ludeling and the company which they represent prevented the settlement, by refusing to agree to a price which Colonel Scott considered the present value of the road.

Northeastern of Georgia.

The Athens (Ga.) *Banner* says that about $228,000 has been subscribed to the stock of this road, but the board of directors has determined not to begin operations until $250,000 is subscribed. This amount, with the $15,000 per mile of State aid, will be sufficient to build the road. The board of directors has elected Dr. J. A. Hunnicutt in place of Mr. R. L. Bloomfield, resigned, and Judge Jeff. Jennings in place of Dr. Willingham, deceased.

Schenectady & Susquehanna.

The Delaware & Hudson Canal Company has leased this road, lately completed, which extends from Schenectady to the line of the Albany & Susquehanna road near Duanesburgh. By the terms of the lease the Delaware & Hudson Canal Company is to furnish the rolling stock and to control and operate the road, paying the company 40 per cent. of the gross earnings. The road was to be opened about August 1.

Springfield & Northwestern.

This road is finished from Havana to Petersburg, and cars are running between those places. The road has been finally located between Springfield and Petersburg. At a meeting held in Springfield July 24, the board of directors annulled the contract with Kilbourne, Bower & Co., and the Executive Committee was ordered to let a contract for completing the road from Springfield to Petersburg and from Havana to Rock Island.

Chicago & Southwestern.

The road from the Leavenworth Bridge across the military reservation to the depot in Sixth street, Leavenworth, has been completed. A new depot will be built at once.

Kansas City & Memphis.

Of the $300,000 in bonds issued by Jackson County, Mo., to this road, 153 bonds have been sold for $126,131, of which $107,000 has been paid to the company, the balance being in the hands of the agent of the county. The creditors of the company have commenced proceedings in bankruptcy.

Chillicothe & Brunswick.

The St. Louis, Kansas City & Northern Company has been operating this road for some time under a temporary agreement, pending the execution of a permanent lease. This has been delayed by legal proceedings on the part of the county of Livingston, and now Mr Blackstone, President of the St. Louis, Kansas City & Northern, has given notice to the Chillicothe & Brunswick Company, that in consequence of this delay and the fact that the road is being operated at a loss, all trains will be withdrawn early in August, unless the lease is executed at once.

Springfield & Lancaster.

A narrow-gauge road is projected, to run from Springfield, Ohio, through London to Lancaster, some 65 miles, and thence some 20 miles further into the coal fields of Perry County. The road is intended to carry coal as its principal traffic.

Lake Shore & Tuscarawas Valley.

This company has offered to build a branch, twelve miles long, from a point on the main line near Clinton to Canton, provided the people will give the right of way and depot grounds, and subscribe $100,000 to the stock of the company.

Columbus & Toledo.

The President of the Cleveland, Columbus, Cincinnati & Indianapolis Railroad Company has offered the use of that road between Delaware and Columbus at a reasonable rate to the Columbus & Toledo Company, provided they adopt the route by Delaware, Findlay and Bowling Green, and also to make arrangements for letting the work.

St. Louis & Leavenworth Narrow-Gauge.

A meeting was held in St. Louis July 1 to organize this company. A committee was appointed to prepare the articles of incorporation, and the prospective capital fixed at $5,000,000. The general route that was decided on is from St. Louis, through St. Louis County, crossing the Missouri River at or near Howell's Ferry and Augusta; thence through the counties of St. Charles, Warren, Montgomery, Calloway, Boone, and on in a northwesterly direction to Leavenworth, the actual line to be determined after surveys are made. Committees were also appointed to obtain subscriptions to the stock.

St. Louis & Manchester.

The surveys of this road are completed and steps are now being taken to secure the right of way. The main line is to run from St. Louis, in a southwesterly direction, to Manchester, with a branch from Rock Springs northward. The whole length will be about 30 miles, and the road is intended for suburban and local traffic. The gauge is to be three feet.

Erie.

On the evening of July 24, the principal building of the repair shops in Jersey City took fire in the carpenter's shop, and the fire had gained such headway before the engines arrived that the firemen could do nothing except to save the adjoining buildings. The building destroyed had been in use hardly three years, and was of brick. It consisted of a front building two stories high, with two wings or extensions in the rear of the main building. On the first story of the main building were the heavy planers and some large lathes; the second story containing the lighter lathes and other tools. The office and drawing-room were also on this floor. One of the rear extensions was two stories in height, the first story being the erecting shop, or repair shop proper. This shop contained twenty-eight pits in two rows, a large traversing table being used to convey the locomotives to and from the pits. The carpenter and pattern shops were on the second floor of this building. The other rear extension was of one story and was used as the blacksmith and boiler shop. In the shop were twenty-four locomotives, all of which were more or less damaged. The tools were all damaged so much as to be worthless, with the exception of the steam-hammer and, perhaps, one or two of the large planers. The large wheel lathes were in a separate building, which was saved. All the books and papers were destroyed, also all the drawings. This last was a serious loss. The total loss is estimated at $500,000, which is said to be fully covered by insurance. The origin of the fire is, as yet, unknown. Two men were killed and one seriously injured by the falling of one of the walls. It is given out that the shop is to be rebuilt at once, and a large number of men have been put at work clearing away the ruins. A strong effort is being made to have the shop removed either to Paterson or Port Jervis, but it is not likely to be successful.

Railroad in Colombia.

The Peoria (Ill.) *Transcript* says: "Mr. D. K. Smith, one of the 'Cauca Valley Mining and Construction Company,' composed principally of gentlemen in this city, informs us that his brother, David R. Smith, who is at present in Bogota, the capital of the United States of Colombia, has obtained permission of the Colombian Congress to build a railroad from Buenevantura, a seaport on the Pacific, across the Andes to Cali, near which place is the 3,000 acres of iron and coal owned by the company mentioned above. When we say acres of iron and coal, we speak almost literally, for the 3,000 acres are composed of the above minerals in a ratio of ten to one of any other substance. The government of Colombia, besides granting large subsidies of bonds and money to the company, also promise them a grant of 10,500,000 acres of land adjoining the railway, which is to cost about $3,000,000, and will take four years to construct. The road will probably, ere many years, be extended to Bogota, the principal obstacle to railroad building in that country being the immense ranges of the Andes, which run parallel with the western coast of South America, throughout almost its entire length."

Western & Atlantic.

There being a movement on the part of the Georgia Legislature to declare the lease of this road (owned by the State) fraudulent, and to take steps towards taking possession of it for the State, Joseph E. Brown, the President of the company of lessees, has written a letter, in which he says he will resist any such attempt, but if there shall be a declaration by a vote of a majority of the people of the State in favor of the State's assuming the management of the road, he will be in favor of giving up the lease. He says that the lessees have spent about half a million for necessary improvements and new equipment, and that several new lines, soon to be completed, are likely to make it very difficult for the lessees to earn the rental, for some time at least.

Sugar River Railroad.

This New Hampshire railroad, which extends from Bradford, N. H., the western terminus of the Concord & Claremont Railroad, westward 30 miles to the Connecticut River at Claremont (18 miles above Bellows Falls), was to be completed this week. It is intended to extend the road from Claremont west about ten miles to the Rutland & Burlington road at Cavendish, which will give the latter line a direct connection with Concord, Portsmouth and the other chief towns of New Hampshire, and a very good one to Portland. About 15 miles of the track of the new road was laid this season. The track is to be extended 2¼ miles further to the Sullivan road, and regular passenger trains are to begin running September 2.

Boston & Albany.

The Springfield *Republican* says that the last survey for the proposed straightening of this railroad is no more favorable than the previous one, and that there no longer seems any prospect of any change of route.

Connecticut Air Line.

The Springfield *Republican* says:

"The Air Line railroad is slowly moving toward completion. A party of railroad men went through from Putnam to Willimantic on Friday, in a passenger car, and not many weeks will elapse before the road will be thrown open to the public travel."

This is the section of the Boston, Hartford & Erie which is to connect with the New Haven, Middletown & Willimantic to form an air line between Boston and New York. It was announced last winter, however, that the last rail was laid on this section (29 miles) December 19.

Gulf, West Texas & Pacific.

The Southwestern (Texas) *Index* says that this road is progressing rapidly and will probably reach Cuero, 20 miles below Gonzales, by October. It will not be extended beyond Cuero either toward Gonzales or San Antonio, unless further donations are made. Gonzales has taken $200,000 in stock, San Antonio $500,000, and Caldwell County $130,000, all to be paid when the railroad is completed to those places respectively. The company now refuses to fulfill its agreement without an absolute donation of $100,000 from San Antonio and a proportionate sum from Gonzales.

St. Louis & Santa Fe.

This road, extending from Holden, Mo. (on the Missouri Pacific), westward to Paola, Kansas, 54 miles (or the 36 miles of it in Missouri), which has been operated by the Missouri, Kansas & Texas Company as the "Osage Division," was sold early in July to satisfy a mortgage to the Land Grant Railway and Trust Company for $170,000. The mortgagee was the purchaser.

Buffalo & Jamestown.

The surveys for this road have been completed, and the Chief Engineer, Robert P. Ewing, has handed in his report. Of the five routes examined, that known as the Gowanda route is selected, on account of the lower grades and less cost of construction. The maximum grades by this line are 45 feet per mile going south and 26 feet per mile going north; and the summit, at Dayton, is 750 feet above Lake Erie.

This line commences at a point in the city of Buffalo so situated as to connect with the lake and canals, and also with the Buffalo Creek Railroad, or with the Buffalo, New York & Philadelphia Railroad, and thence running parallel with the Lake Shore Railroad for a distance of about three miles, thence diverging eastward and running *via* Big Tree Corners, and near Abbott's Corners, White's Corners, Eden Centre, Kerr's Corners, Gowanda, Perrysburg, Dayton, Cherry Creek, Kennedy, Jamestown, Ashville and Panama, to the State line between New York and Pennsylvania in the valley of the Little Brokenstraw Creek. The cost of constructing the road on this line, with all the culverts of masonry and bridges of wrought iron, is estimated at $1,431,274, or $15.728 per mile, for the grading, masonry, etc., and $1,083.350, or $11,894 per mile for the superstructure; a total of $2,514,624, or $27.622 per mile, the distance being 91 miles.

The company has advertised for proposals for building the road. Proposals were required to be handed in to the Chief Engineer, R. P. Ewing, at his office, No. 15 American Block, Buffalo, N. Y., by August 1.

Perth Amboy & Elizabethport.

Chancellor Zabriskie has given his final decision in the case between Mr. John Taylor Johnston and Colonel A. W. Jones, the representative of the Pennsylvania Railroad interests in the board of directors. The Chancellor has continued the injunction against Colonel Jones and his associates, who claimed to be directors of the company. The bridge question having been previously settled by a compromise, the only question in dispute was the location of the new road from the bridge to the crossing of the Pennsylvania road, between Spa Springs and Perth Amboy. The question being now decided, the Perth Amboy & Elizabethport road can be constructed as originally located, and without making connection with the Pennsylvania, except at the bridge. The latter road, it is reported, will make its connection with the bridge by an entirely new branch, which will pass through the western part of Perth Amboy, cross the old track at the Spa Springs, and join the main road below South Elizabeth.

Chicago & Northern Pacific Air Line.

This company asks for proposals, to be handed in to the Chief Engineer, Edward Ruger, at Janesville, Wis., by the 26th of August, for the construction of the bridges, culverts, cattle passes and guards, trestles, piling and fencing on the second section of its road, from Geneva, Wis., northwest to Jefferson, Wis., about 35 miles, and also for completing the grading between those points (the line having been graded many years ago). Profiles, plans and specifications may be seen at the Chief Engineer's office August 5. Bids will be received for the whole or any part of the work.

Jefferson, Wis., on the 20th of July, voted its bonds to the amount of $50,000 in aid of this projected railroad.

Chicago & Cincinnati Air Line.

The Indianapolis *News*, of July 27, says:

"Some two weeks ago, W. A. Bradshaw was appointed Special Master in Chancery in the case of James Pullan, Trustee, vs. the above named company, and to-day was set for hearing the evidence. This suit was commenced in 1864, and is based on the following: In 1848 a charter was granted and a company organized to construct a road from Richmond to Newcastle, a distance of twenty-seven miles. To complete this a loan of $300,000 was effected on first mortgage security. In 1851 the charter was amended so as to allow the company to extend the line *via* Logansport from Newcastle to Lafayette; and in the construction and equipment a second mortgage for same amount as above was given on the company's property. Afterward the whole line passed into the hands of the Cincinnati & Chicago Air Line Railway Company by virtue of a sale under this second mortgage. Suit has now been brought to recover first mortgage of $300,000 with interest, and the Court has ordered the Special Master to ascertain, first, the gross earnings of the route between Newcastle and Richmond for the past fifteen years; also valuation of rolling stock when purchased by the defendant company, with net income received by them since the commencement of their operations. From the gross earnings will be deducted a reasonable rent for rolling stock furnished by defendant, also the expenses necessary to operate this part of their line. After all these have been deducted, the surplus will be used in reducing the first mortgage bonds and interest, and the deficiency, if any, will then be made up by sale of that part of the road lying between Richmond and Newcastle. To arrive at the net earnings of this, Mr. Bradshaw will have to ascertain the gross earnings of the road from Richmond to Chicago during the past fifteen years, and also the expenditures. The work will be one of great magnitude. Many of the books and papers have been destroyed, several of the old agents are dead and there are various other impediments in the way, which will take several months to overcome. The taking of testimony commenced this afternoon—the plaintiff being represented by Judge Tilden, of Cincinnati, and the defense by McDonald, Butler & McDonald, of this city, and E. Walker, of Chicago."

This road now forms a part of the Columbus, Chicago & Indiana Central Railway.

Warren & Venango.

This road is graded for four-fifths of its length, and large gangs of men are at work. The track is being laid and ballasted between Warren and Irvineton, and the whole of the rails and ties necessary for the completion of the road are paid for, delivered and stored at Warren. Two locomotives, 25 flat and 10 box cars have been delivered, and the balance of the rolling stock has been contracted for. It is expected that the road will be completed some time in August. The report that the road had been sold is contradicted.

Pennsylvania Petroleum.

This road is now mostly graded and fenced, and the cars and iron are at Cambridge. The report that work would be suspended on account of the good understanding recently arrived at between the Erie and New York Central companies is considered very unlikely.

Richmond & Danville.

This company is about to build a large fire-proof depot in Richmond. The roof will be of corrugated iron.

Baltimore & Drum Point.

Four lines have been surveyed for this road from the Annapolis & Elk Ridge road to Butler's Tavern in Anne Arundel County, Md. The directors met in Baltimore July 17 and selected the line leaving the Annapolis road at Camp Parole, two and one-half miles from Annapolis.

Kent County.

This road is now complete from Chestertown to Fairlee, Md., except a portion of the ballasting, and regular trains will very soon begin to run. The branch to Chester River has the track laid on it for one-fourth the distance, and very little of the grading remains to be finished. By means of this branch the company will be enabled to use the large and costly wharf which they built some four years ago and which has been of little use hitherto.

Detroit, Eel River & Illinois.

This road is completed to the junction with the Indianapolis, Peru & Chicago road, and through trains are to be run from Detroit to Indianapolis by this route. The new line was opened by an excursion July 25.

Chicago & Rock River.

The Amboy *Journal* says: "The directors of the Chicago & Rock River Railroad Company held a meeting in Chicago July 23, at which we learn that it was decided to extend the time of the contractors for the completion of the road one year, and in the meantime allow them to make a temporary connection east with the Hinckley road."

The late annual report of the Chicago, Burlington & Quincy Company announces that it has issued the new loan of $720,000 for the purchase of this road.

Peachbottom.

The directors of this road have let a number of contracts for the grading and masonry of this road west of the Susquehanna. James Freeland & Co., of Millersburg, have the western section, from North Central Grimstone Bridge, a distance of 20 miles. John T. Wallace took two sections of a mile each, from Grimstone Bridge to Wallace's cut. From Wallace's cut to the mouth of Scott's Run, eleven sections, was all taken by D. W. Grove. The remainder, about seven miles, was let to Samuel Smith, of Taneytown, Md. The work on some of the contracts is to be completed in 14 months, while other contractors are allowed 18 months in which to finish their work. Messrs. Clark & Smith, of Philadelphia, have the contract for the masonry of the line east of the Susquehanna, beginning at Oxford. The line of the road is from Hanover Junction to Peachbottom, Pa., about 30 miles.

New Castle & Franklin.

The line of this road has been located as far as Mercer, by way of the Neshannock, instead of by way of the Little Neshannock, as desired by the Wilmington people. The contracts for the grading are to be given out at once.

Wisconsin Valley.

The grading on this road is finished from Tomah to Grand Rapids, except about 18 miles between Remington and the north branch of the Lemonweir. Work on the bridge is going on rapidly. Arrangements for extending the road through Marathon County are being made.

Iowa Eastern.

It is reported that propositions have been made by this company to the Chicago, Dubuque & Minnesota, for an arrangement by which the Iowa Eastern may be extended to Elkader and become a branch of the other road.

Wilmington, Charlotte & Rutherford.

The recent extension of the Eastern Division of this road was from Peedee, N. C., westward to Lislesville, about eight miles. This terminus has been frequently printed "Forestville." The line is graded about five miles further to Wadesboro, and it is probable that the track will be extended to that point soon. The Western Division is in operation from Charlotte westward to Cherryville, N. C., 43 miles, and the track has been laid for some time a mile and a half further. This week the Receiver, Mr. Onderdonk, has ordered iron shipped, and it will probably be extended to Buffalo Creek (about five miles from Cherryville) soon. A special effort will be made to do this, in order to secure the summer travel to the springs in the vicinity. The grading has for some time been nearly completed to Shelby, about ten miles beyond Buffalo Creek.

The Receiver is authorized to utilize a considerable amount of material on hand and work done in construction; but it is not likely that any extension of the Eastern Division beyond Wadesboro or of the Western beyond Shelby will be undertaken until after the sale under foreclosure and the reorganization of the company. There is one party of the stockholders, however, which talks of preventing the foreclosure and continuing the present organization. About 60 miles remain to be constructed to complete the connection between the two divisions.

Marquette, Houghton & Ontonagon.

This will be the name of the new corporation which will be formed August 23 by the consolidation of the Marquette & Ontonagon and the Houghton & Ontonagon Railroad companies.

Milwaukee & Northern.

Brown County, Wisconsin, has voted to subscribe $75,000 in aid of the extension of this road from Green Bay to Shawano.

Berks County.

The contract for the graduation and masonry of the first 20 miles of this road has been let by the board of managers.

Philadelphia & Reading.

This company have put on, from August 1, a new express train between Harrisburg and Philadelphia. The train leaves Harrisburg at 5 a. m., and Philadelphia at 3:30 p. m., stopping only at the principal stations.

Perkiomen.

Regular trains on this road commenced running to Green Lane July 1. Three passenger trains run each way daily between Perkiomen Junction and Green Lane, a distance of 17 miles.

Colorado Central.

Boulder County, Colorado, has voted to issue $200,000 in bonds, to aid in the construction of the Julesburg & Golden Division of the Colorado Central Railroad.

Atchison, Topeka & Santa Fe.

This road was completed to Pawnee Rock July 27.

Intercolonial.

The track is now completed from Amherst, N. B., east by south to River Philip, 26 miles, in the direction of Truro, N. S., where connection will be made with the Nova Scotia Railroad. This section, which is about 40 miles long, has about 1,000 men working on it, and is to be completed by September and opened for traffic in October. The part of the Intercolonial heretofore in operation is from Amherst northwest to Painsee Junction, on the European & North American road, about 40 miles.

Toledo & Southwestern.

Mr. T. M. Cook, President of this company, informs us that it will be ready to let contracts for the construction of 26 miles of its road about September 1. Information can be obtained of the President, or of M. C. T. Wales, the Secretary, at Toledo.

Indiana & Illinois Central.

This company is now offering its first-mortgage 7 per cent. gold bonds at 90. In announcing the loan, the agents (Walker, Andrews & Co., of No. 14 Wall street) say that the 30 miles of the road across Douglas County, Ill., are completed, that the Western Division of 85 miles, from Montezuma, Ind., to Decatur, Ill., is to be completed this year, the grading being nearly done and the materials, except iron, procured; and that the Eastern Division of 67 miles, from Montezuma to Indianapolis, will be completed in 1873. They say that $1 300,000 in cash is already expended on the road, and that the subscribers to the stock (numbering several very heavy capitalists) are subject to calls for $1,500,000 more. The company owns 32,000 acres of land in Indiana, 2,000 being block coal lands.

Dakota Southern.

The Vermillion, Dakota, *Republican*, of July 11, says that work is progressing rapidly on this line. The road is graded ten miles west of the Big Sioux River and a large force is at work in Yankton County. The road is to be completed to Yankton this summer.

Iowa, Minnesota & North Pacific.

Work on this road between Monroe and Newton, Iowa, is progressing rapidly. The grading and tieing is to be completed by September 1. The surveyors are at work between Newton and Nevada.

Louisiana & Texas.

The alteration of the gauge of this road from 5ft. 6in. to 4ft. 8½in. was to begin on July 20. The work of altering the locomotives and cars has been in progress some time. This alteration is made by Mr. Morgan in order to enable his road to connect with that of the New Orleans, Mobile & Texas Company at Brashear City.

Ohio Valley.

A road with this name is projected to connect the towns of Steubenville, Bellaire, Marietta, Pomeroy, Gallipolis, Ironton and Portsmouth, O.

Austinburg & Fairport.

A company has been formed to build a railroad between these two Ohio towns. The incorporators are L. B. Austin, B. Seeley and Frank Barnes, of Austinburg; W. W. Branch, L. H. Kimball and J. P. Sherer, of Madison; and George E. Paine, R McCormick and H. H. Hine, of Painesville. George E. Paine is President, W. W. Branch, Vice President; and R. McCormick, Secretary and Treasurer.

New Orleans, Mobile & Texas.

The Vermillionville, La., *Advertiser* says: "We have been informed that the contract for building the road from Grand River to Vermillionville has been let out, and that work will commence on that line in a very short time. A large number of hands are now at work on the road between this place and New Iberia, throwing up and repairing the old bed of the New Orleans & Opelousas road."

Port Royal Railroad.

Eight vessels loaded with iron for this road have arrived at Beaufort, S. C. The track is laid as far as Allendale, 55 miles from Beaufort, and track-laying is going on at the rate of ten miles per week. The bridge below Augusta is to be ready by October 1, and it is hoped that the whole road may be in running order by that date.

Lima, Spencerville, Celina & State Line.

The stockholders of this company held a meeting at Lima, O., July 18, and organized by the election of the following board of directors: John Keith, J. M. Junkin, James Irvine, of Allen County; Hon. F. C. Leblond, R. G. Blake, Hon. Thomas J. Godfrey, and Chris. Maurer, of Mercer County. The directors subsequently elected John Keith, President, and James Irvine, Secretary. The organization is for the purpose of perfecting the arrangement with the Lee road in Indiana, and consolidating the two in one general company, so as to give the Indiana road an outlet at Lima both to the East and to the Lake. It is hoped that work will soon be begun on the road, now that all the preliminary matters have been arranged.

Union Depot at Worcester, Mass.

The long-vexed question of the location of the new union railroad depot at Worcester has been finally settled by the State Railroad Commissioners, who approve of the location proposed by the Boston & Albany Railroad, near the corner of Grafton and Shrewsbury streets. The building will be 600 feet by 240, with seven tracks, and will cover part of the ground now occupied by the present freight house and station. The foundations will probably be put in this year.

Piedmont & Potomac.

The Alexandria *Gazette* says: "The engineers of the Piedmont & Potomac Railway Company have completed the survey of the Aldie Division. This completes the location of the road to the point at which it is to cross the Blue Ridge, near Thornton's Gap, in Rappahannock County.

Columbus & Maysville.

The amount of tax necessary to build this road from the north line of Brown County to Ripley, on the Ohio River, has been voted by the townships through which it passes. The whole amount of funds thus far secured for the road is $226,000.

Lake Erie, Evansville & Southwestern.

The first annual report to the shareholders of this company says that the length of the proposed line will be about 300 miles; that the cost of grading will be about $6,000 per mile, except for about 30 miles in Indiana, where the cost will be less than $10,000 per mile. The available resources for constructing the road consist of the company's capital stock, $7,000,000, and its first-mortgage bonds, $6,000,000. Total, $13,000,000. Of the capital stock, $2,000.000 have been subscribed along the line, of which the city of Evansville takes $300,000 payable in its municipal bonds. In Indiana the towns and counties benefited are permitted by law to levy a tax of two per cent. upon the valuation of their taxable real and personal property, and take the stock of the company therefor. The President has executed a contract with the New York Construction Company, to build and equip the entire line.

Railroad Legislation in New Hampshire.

On the last night of the session of the New Hampshire Legislature, the following resolution was passed, supposed to be aimed at Boston & Maine Company: "Whereas, by the laws of New Hampshire, railroad corporations are prohibited from increasing their capital stock without prior authority from the Legislature; and, whereas certain corporations, without such authority from the Legislature of this State, have given notice of such increase, therefore: Resolved by the Senate and House of Representatives in General Court convened, That the Attorney-General be instructed to take such measures as shall secure a full compliance with the laws of this State relative to the increase of the capital stock of railroad corporations."

Lake Shore & Tuscarawas Valley.

The President's first annual report, made to the stockholders July 10, says that 38 miles of track was laid last season, from Grafton to the Silver Creek coal banks. Work was resumed about the 1st of May, and the Engineer reports three-fourths of the work done.

"All the ties necessary for the completion of the road are on the line and 40,000 surplus ones; the contractor has purchased the requisite amount of iron, 2,500 tons of which have been delivered at Cleveland, the balance of 5,000 tons being now received at Massillon. The first lot is of the best *tested* English rail, the second lot was purchased at the Cambria Iron Works, and is of the best quality of American manufacture. All the rails are 56 pounds to the yard and of the most approved pattern. The board of directors have also contracted with the Brooks Locomotive Works for the supply of eight locomotive engines, costing $11,000 each, all of which are of one pattern, having four driving wheels of 5 6-10 feet diameter; cylinder 16x24: weight 30 tons. Seven of the eight engines have been received, five have been paid for by the company, and one by the contractor. The board have also contracted for 200 gondola cars, at a cost of $600 each, 46 of which have been received, and $20,000 paid thereon."

Canada Southern.

The grading and bridging on this road are almost finished; and track-laying is pushed forward rapidly, with the locomotives and construction cars. From Fort Erie to Cayuga, 50 miles, the grading is finished and the ties and rails are being put down. From Cayuga to Hagersville, 10 miles, the line will soon be ready for the track-layers. From Hagersville to Big Creek, 24 miles, and thence to Springfield, the work is finished. On the remainder of the line to St. Thomas, two-thirds of the work is done. The bridge work will be all completed by the close of the present month. The rails, which are steel, and the ties are being delivered at various points along the line, so that track-laying can be carried on in several places at once. It is expected that the main line will be ready by October 1, and locomotives, passenger cars, express and freight cars enough for two trains have been ordered, to be delivered at that time. Twenty-six locomotives and 600 freight cars are under contract to be delivered by December 1. The machine and repair shops are to be ready for use in October. Work on the branches and connecting roads is progressing well, and it is believed that the entire road will be completed and ready for a large business by the end of the year.

Grand Island & Northwestern.

At a meeting of this company held at Omaha, July 16, a resolution was adopted instructing the Chief Engineer to begin the survey at once. Ten per cent. of the stock subscription have been paid in, and Hall County has voted $90,000 in bonds to the road. The company proposes to build a narrow-gauge road from Grand Island, Neb., on the Union Pacific, 154 miles from Omaha, north-west, through Nebraska and Dakota, extending ultimately to a junction with the Northern Pacific.

The Vanderbilt Underground Railroad.

The New York *Tribune* has obtained from Mr. I. S. Buckhout, the engineer, the following information concerning this important work:

"The route has been decided upon, and within the next two months the ground will be broken simultaneously at intervals of about a half mile each along the entire line. The work will be prosecuted with vigor, and within two years from the present time passengers will be able to avail themselves of rapid transit within the thickest portion of the city. Some of the depot sites have been secured, and they will probably be about seven in number. The dimensions of the depots will depend on location and business. The one at Union square will be about eight by twelve feet above the surface. The arrangements of the depots for convenience and safety to passengers are as complete as possible. On entering, the passenger will descend to the track level, and when at the foot of the stairway will find himself on a platform between the two tracks, which diverge near the stations and afford space for a platform sufficient to accommodate a large number of passengers. Thus passengers going in either direction will not need to cross the tracks.

"The connection with the Harlem road above Forty-second street will be made by switches at Forty-sixth street, where the grades of both tracks coincide. From this point the present Harlem tracks will run to the Grand Central Depot as at present, while the grade of the rapid-transit tracks will decline to the east of the Grand Central depot. The central depot will be entirely independent of the down-town road, which will follow the course of Fourth avenue and the Bowery to Pell street, and thence to the City Hall Park. Here will be built a large underground depot. The depots along the line will terminate at Fifty-ninth street, where there will be a large one for the accommodation of visitors to Central Park.

"The road will be so graded as to run beneath the surface throughout the entire length, and no viaduct will be necessary at any point. The lowest point on the line is at Pearl street, where the track will be four feet above high tide. On the Bowery, after leaving the Five Points, the lowest point is at Grand street. The Pearl street sewer will pass above the Underground road. During the building of the road temporary bridges will be built at the crossings of the streets running east and west, so that business will not be impeded. It is supposed by many that passengers will be transferred at the junction of the rapid transit and the Harlem road. The trains, however, which leave the City Hall Park depot will be through trains, no transfer taking place at any part of the route. The cars will be constructed with doors on either side, the seats being athwart; by this arrangement, but little time will be lost in the entrance and exit of passengers. The entire distance from the junction at Forty-sixth street to City Hall Park is about four miles, and the running time, including six stoppages, will be only about ten minutes.

"From Thirteenth to Nineteenth street, and from Thirty-second to Fifty-sixth street, are solid masses of rock, through which open cuts will be made. The grade of the road will vary with the surface. From City Hall to Canal street the grade will be about thirty-six feet to the mile."

Buffalo, Corry & Pittsburgh.

The Erie (Pa.) *Despatch*, of late date, in its report of the proceedings of the United States District Court, says:

"Jerome F. Fargo, of Buffalo, on May 1, filed a petition in the Northern District of New York, asking that the Buffalo, Corry & Pittsburgh Railroad Company be declared bankrupt, the final hearing of which is set down for the 29th inst. Since the filing of this petition, judgments against the company have been issued and levies made, and the property of the company in this State was advertised to be sold on Tuesday, the 16th. On the 15th inst. Mr. Fargo filed his petition in this court and obtained a preliminary injunction restraining the sale on the 16th, and requiring the executive creditors to show cause on the 19th why such injunction should not be made perpetual. The motion was argued yesterday, C. O. Bowman and C. B. Curtis, Esq., appearing for the executive creditors, and M. Crosby, Esq., appearing for the company. The court held that the bankrupt law suspends the proceedings of the State courts and decided against the application of the executive creditors for a dissolution of the preliminary injunction, but granted the injunction restraining the creditors from interfering with the property at issue."

Milwaukee & St. Paul.

Mr. D. J. Whittemore, the Chief Engineer, is now preparing to improve the tunnel under the dividing ridge at Greenfield, Wis., on the old La Crosse line, by taking out the old timber arch, sinking the floor of the tunnel five feet, and arching it all with brick. It is proposed to do this without interrupting the running of trains through the tunnel.

Frederick & Pennsylvania Line.

A sufficient quantity of the second-mortgage bonds has been sold to complete the road. Iron has been purchased and will soon arrive, and it is hoped that the road will be completed by September 15, or in time to carry the winter's coal.

Cumberland & Pennsylvania.

This company has received 250 tons of steel rails from the Harrisburg Steel Works. This is sufficient to relay about two-thirds of the track, and it is understood that the whole track is to be relaid with steel rails.

Oil Creek Railroad.

The Buffalo *Commercial Advertiser*, of July 16, says: "It will be of interest to know that on Saturday last (July 13) the Oil Creek Railway was transferred to the McHenry interest of the Atlantic & Great Western Railway. We learn this from the gentlemen of the committee (of the Oil Producers' Railway), who also state that, hereafter, the Oil Creek road, which for some time has been under the management of the Pennsylvania Central Railroad, will be managed by Mr. P. H. Watson, the newly elected President of the Erie and whilom President of the great 'South Improvement Company.' It was rumored at Titusville yesterday that one of the conditions of the sale was that the Venango Extension of the Dunkirk & Warren Railway should not be completed. This rumor, however, needs confirmation."

Paris & Danville.

This road is about completed to the Little Vermillion. As soon as the bridge is completed the cars will run to Danville.

Vicksburg & Ship Island.

Work has been commenced on this road and it is hoped that 25 miles will be completed by September 1.

St. Louis & Southeastern.

This company, having secured control of the Evansville, Henderson & Nashville Railroad, the two roads are placed under one management. Steps are being taken toward a complete consolidation of the two companies. The stockholders of both companies made last week an excursion to St. Louis to inspect their road. Under the new management, Gen. J. F. Boyd is General Superintendent, with office at Evansville; W. T. Jacoby, Assistant Superintendent, with office at Hopkinsville, Ky., and George S. Winslow, Assistant Superintendent, with office at Mount Vernon, Ill.

Bedford & Bridgeport.

The completion of this road, which connects with the Cumberland & Pennsylvania Railroad three and a half miles north of Cumberland, is announced. This gives the people of Cumberland a competing line shorter than any other to New York and Philadelphia; and besides opening to the coal companies a new market among the manufactories of Pennsylvania, it enables them to place coal at Jersey City, without breaking bulk. The road is controlled by the Pennsylvania Railroad Company. The entire length of the road is 30.7 miles from Mount Dallas, where it connects with the Huntington & Broad Top road, southwest to this junction on the Cumberland road, about one-half of which is now first opened.

New York & Troy Steamboats.

The Hancox Line of Steamboats running between New York and Troy has been discontinued. The extortions of this line, last season, led to the establishment, this season, of the "Citizens' Line," with the steamboats Sunnyside and Thomas Powell. The Hancox line has, in consequence, been running at a loss, until the company has gone into bankruptcy, and their boats—the Connecticut, Vanderbilt and Golden Gate—have been libeled by the United States Marshal. Since the opposition has ceased the Citizens' line has raised the fare to Troy from 50 cents to $1.50, which is about a fair rate—a cent a mile.

New Jersey West Line.

The Jersey City *Standard* says that all business matters between Judge Packer and the new board of directors have been pleasantly and satisfactorily arranged. Some of the cars of the Lehigh Valley road are still on the West Line, but no demand for their return has been made. No arrangements have been made, nor are any in progress, between the New Jersey West Line and New Jersey Central and Delaware, Lackawanna & Western companies.

Michigan Central.

The mail train heretofore leaving Chicago at 6 a. m., and arriving at 8.20 p. m., now leaves Chicago at 5.30 a. m., and arrives at 8.45 p. m.

For the better accommodation of local travel from Kalamazoo and points east, an additional train has been added between Kalamazoo and Detroit, which leaves the former place at 5 a. m., and arrives at Detroit at 11.30 a. m., connecting there with the Great Western Detroit express for all points east. Returning, this train leaves Detroit at 8.15 p. m., and reaches Kalamazoo at 4 a. m.

An additional Pullman sleeping car has been attached to the Atlantic express east, leaving Chicago at 5.15 p. m., daily, which runs through to Niagara Falls (not Suspension Bridge), without change.

St. Louis & Iron Mountain.

The Arkansas Branch is completed to the Black River, near Poplar Bluff, in Butler County, Mo., near the Arkansas line, 28 miles from last winter's terminus at Mill Spring, and 76½ miles from the junction with the main line at Bismarck.

Cairo & Fulton.

The work on this road is progressing so rapidly that it is believed the road will be completed to Little Rock by January, or possibly sooner. From Little Rock south it is reported that two roads will be built. One, the original route (the direct prolongation of the road from Cairo), will run southwest to Fulton, on Red River, where it will connect with the Trans-Continental road. The other will run south to the important town of Camden, in Ouachita County. Work is progressing on the road south of Little Rock, and iron enough has been delivered to lay the road to the Saline River, 35 miles south of Little Rock. From that point to Camden the distance is 55 miles. Dallas and Ouachita counties have each subscribed $100,000 to the Camden Branch.

Kansas City & Fort Smith.

It is reported that arrangements have been made for the immediate construction of this road.

Philadelphia & Reading.

This company has notified the Adams Express Company that the terms of their contract with the railroad company having ceased, the latter will repossess itself of the express freight business transacted over its line. The railroad company has secured offices on the north side of Chestnut street, Philadelphia, which will be commodiously fitted up, and it is their intention to run the express freight to all the stations on their line in the same way as the express company now does it. It is understood that the Adams Express Company will retain the money business, which is an important item, and will also retain as many of their old freight offices as possible, hoping to retain a share of the business, by reason of the advantages given them by their extensive connections. The express business done over the Reading road is very large. The company also assumes entire control of its telegraph line.

Arkansas Central.

Work on this narrow-gauge road is progressing steadily, and it is hoped that some 50 miles—from Helena, west, to Clarendon, on White River—will be ready for use in August. Arrangements have been made for the purchase of all the iron needed.

Western & Atlantic.

The report of this company covers the period from December 27, 1870, to January 1, 1872. The gross earnings were $1,397,743.60, and the expenses $1,678,765.11, or $281,022.51 more than the earnings. The road, which was in very poor condition, has been much improved, 26 miles of new iron have been laid, and seven new engines, 215 new box cars and twelve new coal cars bought. 40 miles more of new iron are needed. There are 26 bridges, aggregating 5,550 feet long. These are being covered. The road has lost business, because much Western freight and travel that used to go over the State road go by the Selma, Rome & Dalton road, the Alabama & Chattanooga road, and the North & South road.

Other railroad enterprises threaten further loss of business which the lessees must counteract, the Air-Line road from Charlotte to Atlanta, and the road from Columbus to Chattanooga, Griffin to Stevenson, Macon to Knoxville, and the Georgia Western road. It is proposed to secure freight lines to the West. Steps have already been taken to obtain a line to St. Louis and Cincinnati. The President urges the company to go on and put the road in first-class condition. The Superintendent's report says that the road must be worked very economically to make it pay. The tonnage of the road south was 651,001,490 pounds, and north, 58,564,837 pounds, only about one out of thirteen cars going north loaded. The locomotives ran 966,387 miles and consumed 32,306 cords of wood.

Vicksburg, Shreveport & Texas.

The New Orleans *Picayune* of July 6, says: "An important conference took place between Col. Thomas A. Scott on the one hand and parties representing the North Louisiana & Texas Railroad Company and the bondholders of the Vicksburgh, Shreveport & Texas Railroad Company on the other. The object of this conference was to ascertain if terms could be agreed upon satisfactory to all parties interested in the property (at present in the possession of and operated by the company first named) by which the litigation involving the title and ownership of this railroad, now pending on appeal before the Supreme Court of the United States, could be settled at once, the appeal withdrawn and the road go into new hands, with a view of its early completion to Shreveport. The North Louisiana & Texas Railroad Company was represented by a committee of three of its members, and the bondholders of the Vicksburg, Shreveport & Texas Company, who are principally residents of Georgia, by the Messrs. Grant, contractors, of Atlanta, who are the largest holders of the bonds. We have not learned the result of the interview, but from a bondholder who had on his own account a conversation with Col. Scott, we learn that the latter is disposed to purchase the Vicksburg, Shreveport & Texas Railroad if the parties interested in it accept his terms and give him a clear title to the property. He does not regard the sale of this road by the Sheriff of Ouachita parish, in 1866, as being a valid sale, or as conveying a title to Ludeling, Ray and others, the purchasers at that sale. He regards the title as still being in the original company, and the claims of the bondholders of the latter as not having been extinguished by the sale to Ludeling and company; consequently, Col. Scott would not purchase *their* title. As to the value of the road, Col. Scott places a very different estimate upon it from that of the parties now in possession, and if there be any difficulty in coming to an understanding, it will be as regards the price to be paid."

Lafayette, Bloomington & Mississippi.

Regular trains began running over this road between Lafayette and Bloomington, July 15.

Providence & Worcester.

A branch is to be built from this road at Woonsocket to connect with the Providence & Springfield road.

Southern Pacific of California.

A Los Angeles dispatch to the San Francisco *Bulletin* gives the proposition made by this company to the Railroad Committee of Thirty. The proposition is as follows: "The Southern Pacific Company will build 50 miles in fifteen months, from the time that the county of Los Angeles has had a favorable vote on the subsidy, commencing at Los Angeles, provided that favorable arrangements can be made with the Los Angeles & San Pedro Railroad Company, which latter will be ascertained before the time of submitting the question to a vote. The bonds will only be required as the road is being built. Whenever five miles are built bonds will be issued for that amount, in proportion to the number of miles built through the county of Los Angeles. They will have nothing to do with any lateral railroads outside of the main trunk, and will not be willing to give any portion of the subsidy granted toward the building of the road to Anaheim. This subsidy shall be an absolute donation, and the subsidy is understood to be 5 per cent. on the assessed value of the real and personal property in the county of Los Angeles, for the year 1872, which is supposed to be $15,000,000, less the bonds which have been already given to the Los Angeles & San Pedro Railroad Company, the stock in which road held by the county is also to be donated to the Southern Pacific Company." A committee of three was appointed to confer with the various corporations and obtain definite propositions, and also to obtain some further explanation of the above proposition. The amount of county bonds voted to the Los Angeles & San Pedro Company is $150,000.

Wisconsin entral.

The Boston *Advertiser*, of July 23, says of this company's new lease;

"The Wisconsin Central Railroad Company has leased on satisfactory terms, for 99 years, the road of the Milwaukee, Lake Shore & Western Railroad Company, which company is a consolidation of the Milwaukee, Manitowoc & Green Bay and the Appleton & New London Railroad companies. This leased road extends from Appleton to Manitowoc, thence to Milwaukee, and passes through a finely settled country, which boasts a population of over 150,000. It is to be completed and passed into the hands of the Wisconsin Central by November 1, and it is believed it will be a paying road from its commencement. This completes the line of the Wisconsin Central from Lake Superior to Manitowoc on Lake Michigan, where it connects by boat across the lake with railroads running directly to Detroit and New York, making the shortest line from Lake Superior and the terminus of the Northern Pacific Railroad to New York by about 250 miles. It also has the shore line from Manitowoc through Sheboygan to Milwaukee, there making direct connection by another road to Chicago. This line, from the termination of the Northern Pacific to Chicago, is about 100 miles shorter than any other route. The whole country from Milwaukee to Lake Superior through which the road passes, comprises some of the very best farming lands in the United States. The pine and hardwood timber, and the iron property are not to be surpassed in value by any other section in the country.

"This whole enterprise is being pushed forward with great vigor, and the parties interested are confident of its ultimate success, which opinion is sustained by those best acquainted with this portion of the country. The income from that part of the road which is now running is sufficient to pay all expenses and the interest on the bonds now issued. The Wisconsin Central will have 300 miles of road running this fall."

We learn that a section of 20 miles west of Stevens' Point is now completed.

Oil Producers' Railway.

A committee, appointed by the directors of the Oil Producers' Railway Company, was at Buffalo, July 16, for the purpose of making arrangements with the Buffalo & Jamestown Company to connect the two roads at the State line and operate them as one line. Two lines have been surveyed from Titusville to Garland, on the State line, and everything is in readiness to begin work.

Ionia, Stanton & Northwestern.

This company was organized at a meeting held at Ionia, Mich., July 16, when $62,000 was subscribed to the capital stock and articles of association signed. The proposed road begins on the Detroit, Lansing & Lake Michigan road, three miles northwest of Ionia, extends thence north through Sheridan and Stanton to Chippewa, on the Flint & Pere Marquette road, making a line about 62 miles long. Surveys are to be begun at once. The directors chosen were: H. H. Smith, James F. Joy, Nelson M. Turner, E. K. Wood, Wm. B. Stone, W. B. Poyl and E. H. Stanton. The board of directors elected as their Secretary and Treasurer Mr. E. H. Stanton, of Ionia, and also an Executive Committee, consisting of Messrs. H. H. Smith, N. M. Turner and E. H. Stanton.

Chester & Iron Mountain.

The certificate of incorporation of this company was filed with the Secretary of State, of Missouri, July 19. The road is to commence at a point in Perry County, Mo., opposite Chester, Ill., and run through Ste. Genevieve and St. Francois Counties to Iron Mountain, and be about sixty miles long. The company is authorized to bridge the Mississippi. Capital, $1,000,000. Directors: Edward Harrison, W. P. Collier, C. A. Beecher, R. R. Dawes, E. C. Dawes, R. H. Fleming and W. B. Stevenson.

Houston & Texas Central.

The Dallas, Texas, *Herald* says that the contract for grading the road from Dallas to Rawlett's Creek has been let to Hyatt & Son, late contractors on the Houston & Great Northern. The section from Rawlett's Creek to Red River has been let to B. O. Conner & Son. It is reported that the connection with the Missouri, Kansas & Texas road will be made about ten miles below Preston.

Missouri & Mississippi.

The Macon, Mo., *Republican* says that track laying has commenced upon this road. A connection has been made with the St. Louis, Kansas City & Northern road, and the iron will be laid down as fast as received until Edina is reached. This road is intended to run from Keokuk, Iowa, southwest to Glasgow, Mo., about 131 miles. Considerable grading was done on the road two or three years ago.

Lowell & Andover.

The construction of this projected road has been abandoned for the present, the cost of construction, as estimated by the engineers, being much greater than was anticipated.

Boston & Maine.

On the extension of this road to Portland, track-laying is in progress from Salmon Falls, east. The piling for the bridge across Fox River is complete and ready for the superstructure, and the superstructure of the iron bridge across the Saco has arrived. Work on the track in Portland has commenced; 12 locomotives and 14 passenger coaches have been ordered for the extension. It is hoped that trains will be running by October 15.